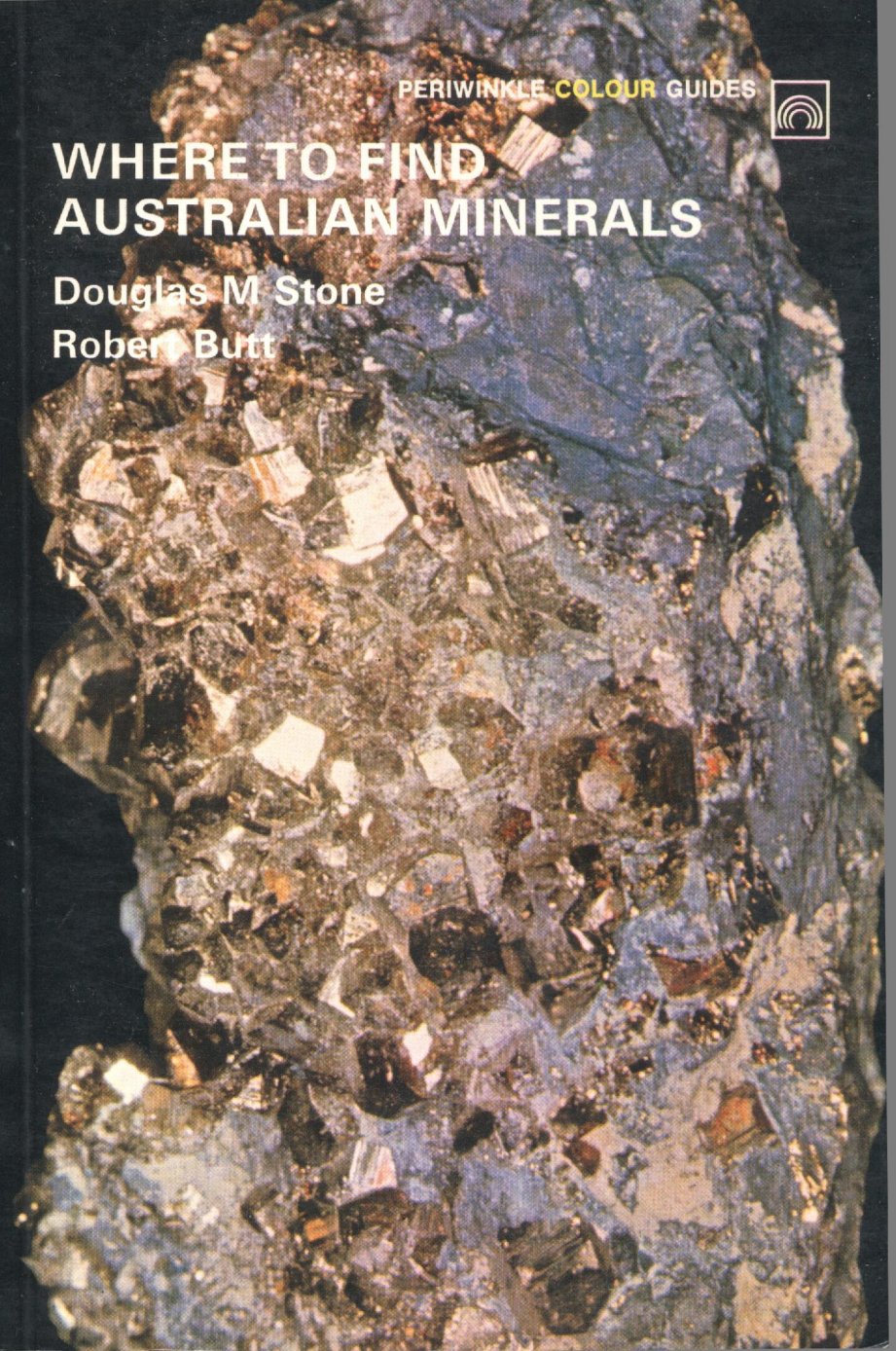
PERIWINKLE COLOUR GUIDES

WHERE TO FIND AUSTRALIAN MINERALS

Douglas M Stone
Robert Butt



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PERIWINKLE BOOKS

First published 1972 by
Lansdowne Press Pty Ltd
37 Little Bourke Street, Melbourne 3000.
© Doug Stone and Bob Butt, 1972
Type set by Monotrade Pty Ltd, Melbourne
Printed and bound in Hong Kong
SBN 7018 0253 7
Cover photograph Pyrite Crystals

Periwinkle books are prepared with the assistance of an advisory panel of specialists in the fields of education and the natural sciences. The publishers gratefully acknowledge the co-operation of staff at museums, herbariums and universities throughout Australia, and invite comment on present and projected titles in the series.

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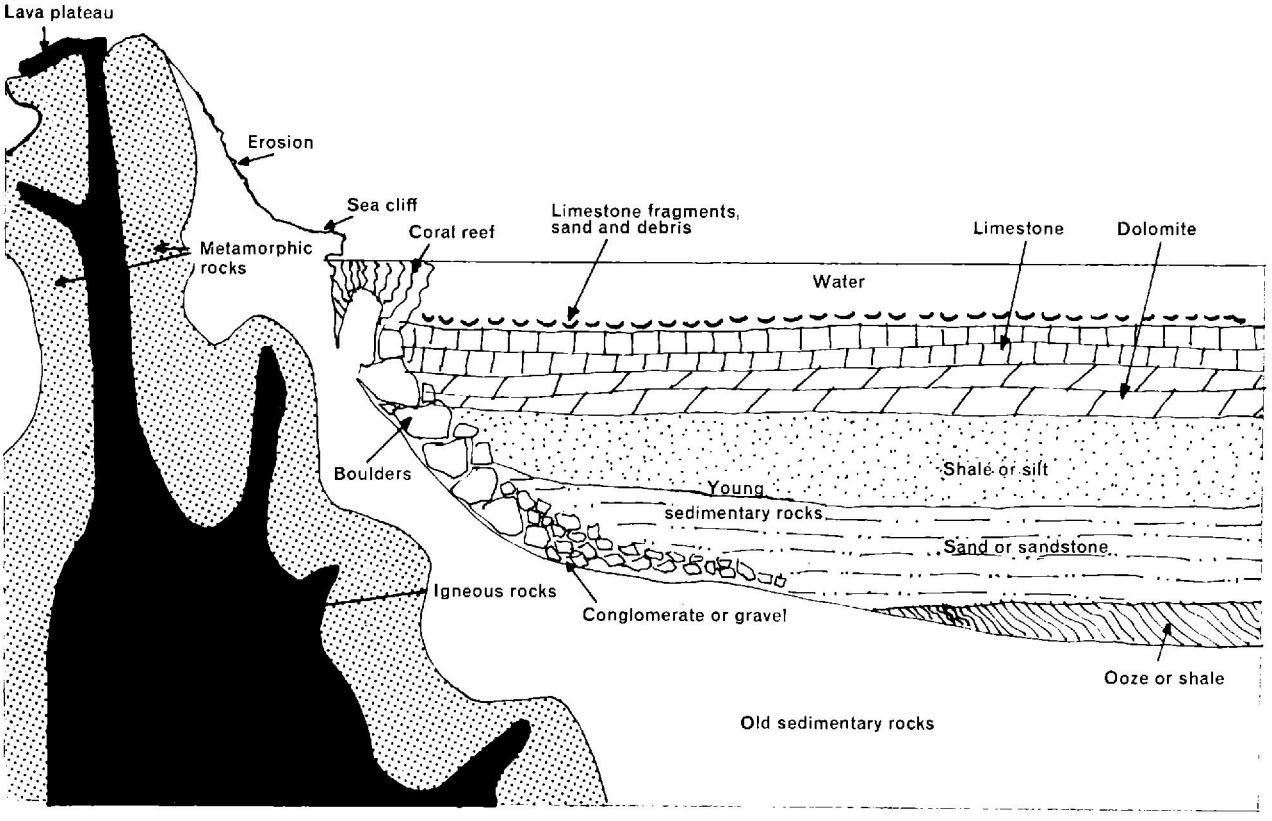

Lava plateau
Erosion
Sea cliff
Coral reef
Limestone fragments, sand and debris
Limestone
Dolomite
Metamorphic rocks
Water
Boulders
Shale or silt
Young sedimentary rocks
Sand or sandstone
Igneous rocks
Conglomerate or gravel
Ooze or shale
Old sedimentary rocks

Chapter 1

ORIGIN OF MINERALS

A mineral is any naturally formed inorganic substance which has a definite chemical composition and possesses certain physical properties, which enable them to be distinguished from other substances.

Minerals have a period of conception and development and may change and decompose, allowing a new generation to form from the parent material. They take form in many different ways; however, it is seldom that we are able to reconstruct or trace the stages of development which have led to the mineral we recognize only as the final product. Vapours have deposited some of these minerals; others have crystallized as molten rock has cooled; most minerals have formed by crystallizing from a liquid solution; some new minerals have developed by metamorphism when water and other chemical agents have acted under conditions of high temperature and/or pressure; while others have formed by the gradual replacement of one mineral by another.

Solid materials, for example sulphur, rock salt and hematite, found near the lip of a volcano's crater have been deposited from the vapours and gases emitted.

Minerals of various types have come from the molten rock streaming out of volcanoes as lava. This molten material solidifies giving rise to minerals such as feldspar, olivine, magnetite, augite and leucite.

The water on the surface and in the crust of the earth dissolves solid materials and re-deposits them in other forms. From the largest of all solutions, the sea, immense deposits of rock salt have been formed with associated beds of gypsum and anhydrite. In the earth's crust water circulates in the cracks and crevices of the rocks and is often heavily charged with mineral matter as is shown by the springs of mineral water discharging at the surface. The mineral matter held in solution by these underground waters may, under suitable conditions, be deposited as crystals. As the water evaporates, gypsum crystals may be deposited in cavities; if two solutions containing different materials become mixed new compounds may be formed. If these are only slightly soluble in water they will be deposited; for example, the insoluble barytes ($BaSO_4$) which may be deposited when in a rock crevice. Water containing in solution a small amount of barium chloride may meet another solution containing calcium sulphate: by the interaction of the materials in the two solutions barium sulphate is formed, and being insoluble in

water, it is deposited on the walls of the crevice.

Weathering

Water which falls as rain on the earth's surface takes into solution from the air and from the surface soil small amounts of oxygen, carbon dioxide and other substances. The water with its impurities sinks into the rocks of the earth's crust, and so is able to react on various minerals. Pure water has very little action on most minerals; however, when gases are present in solution, many minerals, even the more resistant, will slowly decompose and dissolve. Crystals will begin to lose their brilliancy and lustre, becoming on their surface, dull and rough, or they may even completely dissolve and be carried away in solution. Certain constituents only may be dissolved and removed, leaving others in a powdery form. In weathering processes of this kind the form of the original mineral is rarely retained. The water which has been the cause of this weathering and decomposition of the minerals has thereby gained mineral matter in solution. Under other conditions, new minerals may be deposited and these in their turn will be subjected to weathering processes.

There are, therefore, going on in the earth's crust, slow but continual processes resulting in the formation and destruction of minerals.

Chapter 2

SIMPLE TESTS FOR IDENTIFYING MINERALS

To help the prospector and collector identify minerals in the field, the optical properties of colour, lustre, streak and the mechanical properties such as hardness, cleavage and fracture are outlined below in detail. If the beginner has little or no knowledge of the names given to his collected minerals, similar looking material may be confused and wrongly identified. Examples are pyrite, pyrites or iron pyrites. These are various names given to one mineral which is also known as 'Mundic' in the gold fields. Many prospectors will also be aware of it as 'Fools Gold', so named because of it's resemblance to real gold. It is a yellow metallic looking mineral sometimes found in close association with gold in ore bodies.

With the aid of a knife blade and a small piece of porcelain it is easy to distinguish between the pyrites and gold. The test for hardness is one of the easiest to be carried out in the field. Gold has an approximate hardness of 2·5–3 and pyrites has a hardness of between 6–6·5. A knife blade has a hardness of approximately 5·5 therefore it will cut into gold with ease, but will not mark pyrites. A distinction between the two minerals is then quite obvious.

An alternative test is the 'streak colour' identification. Gold will leave a yellowish streak, pyrites a green or brownish-black streak.

By combining the results of these two simple tests the mineral being examined should be easily identified.

The handling of previously identified minerals is also valuable in learning to quickly distinguish between them; such collections can be found in geological sections of museums. The prospector, by judging the specific gravity (whether high or low) and the feel of the mineral (whether smooth, soapy, chalky), will soon become proficient in identifying each piece.

When attempting to identify a specimen the identification tables are the most important point of reference, the first column giving lists of hardness. Other physical properties are listed in the following order: hardness, colour, streak, lustre, cleavage, fracture and specific gravity (weight).

The tests described in this chapter will simply and efficiently distinguish between minerals. The collector must persevere with the tests and learn to evaluate the results accurately.

An explanation of the nature of each test is given, with lists of incidental equipment needed for each.

Hardness

This is the capacity of a mineral to resist abrasion. The hardness of a mineral, since it varies from one type of material to another, and is consistent within that one type, is a valuable and reliable aid to identification. A scale of hardness, frequently referred to, is 'Moh's Scale'; in a relative manner it measures the mineral's capacity to resist abrasion, the numbers one to ten categorize the degree of hardness, with one applied to the softest mineral, and ten referring to the hardest.

Moh's Scale

1—*Talc* Easily scratched with the fingernail.

2—*Gypsum* A fingernail will barely mark it; will not scratch a copper coin.

3—*Calcite* Will scratch copper or can be scratched by it; is not scratched by a fingernail.

4—*Fluorite* Does not scratch apatite or glass; scratches copper.

5—*Apatite* Scratches glass with difficulty; is scratched by glass with difficulty; does not scratch feldspar.

6—*Feldspar* Scratches glass easily; scratched with difficulty by a knife blade.

7—*Quartz* Not scratched by a knife blade; scratched with difficulty by a file.

8—*Topaz* Will scratch quartz; will not scratch corundum; is scratched by corundum.

9—*Corundum* Will scratch topaz; will not scratch diamond.

10—*Diamond* Not scratched by any known natural substance; will scratch any other natural substance.

Below is a list of everyday items and their hardness:

Fingernail 2·5
Copper coin 3
Glass 5–5·5
Knife blade 5·5–6
File 6·5–7
Silicon carbide 9

The prospector can make simple hardness pencils for carrying into the field. He can then test the hardness of previously identified minerals with those newly found. The pencils are made from a short brass rod with a known mineral (taken from Moh's scale) fitted to either end. The minerals in the scale are available from most rock shops, although Corundum (No 9) may be difficult to obtain. A piece of broken synthetic corundum from a gem supply house is adequate. The cost of a diamond is not exorbitant when purchased from an industrial diamond supplier—it may be $5.

When testing for hardness care should be taken that the scratch is

a distinct groove, not merely a surface abrasion.

Colour

The colour of a mineral will obviously help in mineral identification, however, care should be taken that the colour is noted only from a freshly-broken surface. In many cases the exterior of a specimen is discoloured due to weathering or oxidisation. With metallic ores this oxidisation may also be a useful aid to identification.

The atomic structure of a mineral generally gives the mineral its colour and most metallic ores have a uniform colour for each grouping, however, owing to the presence of minute amounts of impurities, other minerals display a variety of colours. An example is Quartz, a mineral which may appear as colourless, white, yellow, brown, pink, purple, black or green. The dependence on colour as the *sole* means of identification is therefore not advisable.

Streak

A mineral frequently has a different colour when in a powdered form. To identify some minerals, e.g. hematite, it is useful to discover this colour, which will show when the mineral is scraped against a streak plate. The streak plate is a piece of unglazed porcelain, similar to that found on the reverse side of a glazed tile (which is often used for this purpose by the prospector in the field).

Lustre

The lustre of a mineral is determined by its ability to absorb or reflect the light striking its surface. Following are the terms commonly used to describe lustre:

Metallic	These minerals have the appearance of metal, e.g. gold, pyrites, galena.
Adamantine	This type of lustre appears hard, sparkling and brilliant, e.g. diamond.
Vitreous	Such minerals look glassy, e.g. quartz.
Resinous	The minerals have a texture like resin, e.g. opal, amber.
Waxy	The minerals have a texture like wax, e.g. turquoise.
Pearly	The mineral is iridescent like the inside of sea shells as in mother of pearl, e.g. moonstone.
Greasy	The mineral has an oily or greasy feel, e.g. haematite.
Silky	Such minerals appear to be made up of many silk threads, e.g. fibrous gypsum.
Earthy or *dull*	Minerals which have no lustre, e.g. clay, kaolin.

The prefix 'sub' may be used where a specific type of lustre is less pronounced e.g. sub-metallic or sub-vitreous. Such minerals would not be *obviously* metallic or glassy.

Cleavage

Some minerals will split or cleave along planes leaving another smooth surface. An example is the mineral mica which cleaves in flat layers, it is therefore perfectly basal. Unlike mica, galena cleaves in three directions yielding cubes. An example of a more complicated form of cleavage is the rhombohedral piece, obtained from broken calcite.

Cleavage is usually described by the following terms:

Perfect	Easily obtained, e.g. calcite cleavage.
Good or Distinct	Not as easily obtained as the perfect cleavage.
Imperfect	Comparatively difficult to obtain.
Poor or Difficult	Difficult to obtain.

Fracture

The 'fracture' of a mineral results when minerals break in a direction other than along a cleavage plane. There are various types of fracturing and the following terms describe each:

Conchoidal	The surface is covered by concentric waves, e.g. quartz and glass.
Subconchoidal	This curved fracture is not as pronounced as that described as conchoidal.
Even	The break is flat and reasonably smooth, e.g. galena, chert.
Uneven	The surface is rough and covered by small elevations and depressions, e.g. barite.
Hackley	The surface is rough pointed and jagged, e.g. silver, copper.
Earthy	A chalk-like composition that breaks into pieces as dirt or clay.
Splintery	Breaks into splinters and fibres.

Specific Gravity

Specific gravity is the ratio between the weight of the mineral and the weight of an equal volume of pure water at 60°F. One of the simpler methods of determining specific gravity is to use a chemical balance. Suspend the specimen on a fine thread from one arm of the balance above the pan and note the weight of the specimen; call this weight W.A. Hold a beaker of water in a position where the specimen is immersed and take the weight again; call the weight W.W.

To determine the specific gravity divide the weight in air W.A. by the difference between weight in air W.A. and weight in water W.W.

$$\text{Specific Gravity} = \frac{\text{W.A.}}{\text{W.A.}-\text{W.W.}}$$

SIMPLE TESTS TO DISTINGUISH BETWEEN MINERALS

Blowpipe Tests

The blowpipe is used in two kinds of tests:

1. Blowpipe tests on charcoal block and
2. Bead tests.

Skilled use of the blowpipe is only possible after long and steady practice, since the person carrying out the tests must be able to keep up a steady flow of air from the blowpipe for the duration of the test. The type of blowpipe illustrated is easily obtainable and, with practice, easy to use.

The blowpipe sends a jet of air into a flame (the flame from a candle, gas jet, or spirit lamp can be used). This jet of air elongates the flame at right angles to its source making it into a narrow cone, as illustrated.

For a reducing flame the air jet of the blowpipe is held just behind the flame and a steady jet of air is directed at the flame. The tip of the interior blue cone in the flame is known as the reducing flame.

For the oxidising flame insert the air jet a short way into the flame and blow a steady jet of air at the tip of the flame to produce the oxidising flame.

The whole art of using the blowpipe is to keep up a steady flow of air from the mouth while breathing and replenishing the air in the cheeks through the nose. Keep the cheeks inflated and allow a steady stream of air to blow through the blowpipe at the same time breathing through the nose.

Charcoal Block Tests

Charcoal blocks are easily obtained and help to identify certain minerals. A small hollow is scooped out of one end of the block and a powdered sample of the mineral is placed therein; this sample is to be heated in an oxidising flame of the blowpipe. Changes are then noted. Sometimes dense fumes are given off or a characteristic odour is noticed, or a coloured film (SUBLIMATE) may be left coating the charcoal block. In the case of some tests a bead of metal is left in the hollow. In other tests the flame may take on a colour characteristic of certain minerals, or the assay may be of one colour when hot and another when cold.

Some of the reactions of various minerals on charcoal are listed below:

Antimony	A dense white coating close to assay with a bluish outer edge; heavy smoke continues after heating.
Arsenic	A white coating far from the assay with an odour of garlic.
Bismuth	A yellow coating near the assay when hot, with a lighter yellow when cooled; a small metallic bead may form.
Copper	In the assay beads of metallic copper are produced using reducing flame. The flame colour is bright blue or green.
Gold	A soft yellow malleable button or bead is left.
Lead	A yellow coat near the assay with small beads of metallic lead.
Silver	A white globule or button of metallic silver remains.
Tin	There is yellow near the assay when hot and white when cold. Small beads of metallic tin form.
Zinc	It is yellow when hot and white when cold. Add a drop of cobalt nitrate solution to coating and heat strongly. A blue green to bright green coat will result.

This then will give you some idea of the assays on charcoal blocks. We have listed a few but more advanced books will give a greater range.

In some cases fluxes may be added to the minerals in the assay to give different results.

Bead Tests

Equipment needed for making bead tests:

Blowpipe
Spirit lamp or bunsen burner
Platinum Wire 2½″ long
Glass tube
Fluxes

First make a platinum loop. The glass tube is heated until red and soft, the platinum wire should then be inserted a short way and crimped (compressed into folds; *bent* into shape). This should hold the wire in place and makes a convenient handle. A small loop is bent into the other end of the wire. The loop should be a little smaller than a match head.

Method:

Heat the platinum loop and dip it into a flux of borax or microcosmic salt. Reheat the flux so that a molten bead forms in this loop. To enlarge the bead the loop can be redipped into the flux and reheated. If the bead appears coloured or cloudy it should be removed from

the loop by simply reducing it again to a molten state. When a hot colourless bead is formed it is touched to a small amount of the powdered mineral to be tested.

Reheat in the oxidising and reducing flame (previously explained). The following characteristics should be noted:

1 Colour whilst hot after heating in oxidising flame.
2 Colour whilst cold after heating in oxidising flame.
3 Colour whilst hot after heating in reducing flame.
4 Colour whilst cold after heating in reducing flame.

A guide to some of the colours produced with bead tests on common minerals is given in this table.

BORAX BEAD TESTS

	OXIDISING FLAME		REDUCING FLAME	
	Hot	**Cold**	**Hot**	**Cold**
Antimony	Yellow	Colourless	Yellow	Colourless
Chromium	Yellow	Green	Green	Green
Cobalt	Blue	Blue	Blue	Blue
Copper	Green	Blue	Colourless	Opaque red
Iron	Yellow	Green	Green	Green
Lead	Yellow	Colourless	Yellow	Colourless
Manganese	Violet	Violet to red brown	Colourless	Colourless
Molybdenum	Yellow	Colourless	Brown	Grey to black
Nickel	Violet	Brown	Grey	Grey
Tungsten	Yellow	Colourless to white	Yellow	Brown
Uranium	Yellow, orange red	Yellow to brown	Green	Green to black

MICROCOSMIC SALT BEAD TESTS

	Hot	**Cold**	**Hot**	**Cold**
Chromium	Red	Green	Red Green	Green
Cobalt	Blue	Blue	Blue	Blue
Copper	Green	Blue	Brown	Red
Iron	Brown, red	Brown, yellow	Red	Red to purple
Manganese	Violet	Violet	Colourless	Colourless
Molybdenum	Green	Colourless	Green	Green
Titanium	Yellow	Colourless	Yellow	Violet
Uranium	Yellow	Yellow to green	Yellow, green	Green
Vanadium	Yellow	Yellow	Green	Green

Chapter 3

IDENTIFICATION TABLES

In the identification tables which follow the minerals have been categorised in hardness groups. The alphabetical mineral name table has been included to facilitate finding the hardness group to which the relevant mineral belongs.

150 Alexandrite
53 Alunite
114 Amblygonite
86 Analcite
143 Andalusite
135 Andradite G.
41 Anglesite
45 Anhydrite
54 Ankerite
117 Anorthite
75 Apophyllite
55 Aragonite
14 Argentite
109 Arsenopyrite
46 Atacamite
12 Aurichalcite
128 Axinite

47 Barite
146 Beryl
29 Biotite
15 Bismuth
13 Bismuthinite

76 Calamine
30 Calaverite
43 Calcite
126 Cassiterite
48 Celestite
49 Cerussite
72 Chabazite
24 Chalcanthite
81 Chlorapatite
25 Chlorite
106 Chromite
150 Chrysoberyl
23 Chrysocolla
16 Cinnibar
107 Cobaltite
68 Colemanite
118 Columbite
31 Copper
5 Covellite
32 Crocoite
26 Cryolite
56 Cuprite

140 Danburite
152 Diamond
129 Diaspore
97 Diopside
82 Dioptase
57 Dolomite

10 Erythrite
64 Fluorite
83 Fluorapatite

27 Galena
130 Gadolinite
147 Gahnite
133 Garnet
134 Garnet Almandine
108 Gersdorffite
38 Gibbsite
74 Gmelinite
87 Goethite
33 Gold
3 Graphite
136 Grossularite G.
6 Gypsum

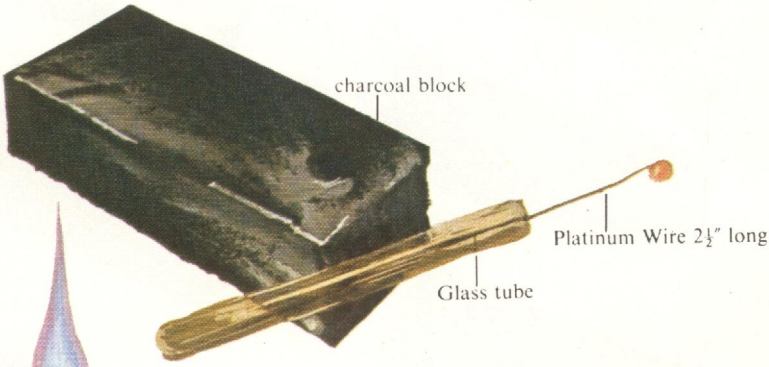
28 Halite
98 Hematite
17 Hessite
58 Heulandite
99 Hornblende
18 Hydrozincite
100 Hypersthene
101 Ilmenite
127 Iridosmine

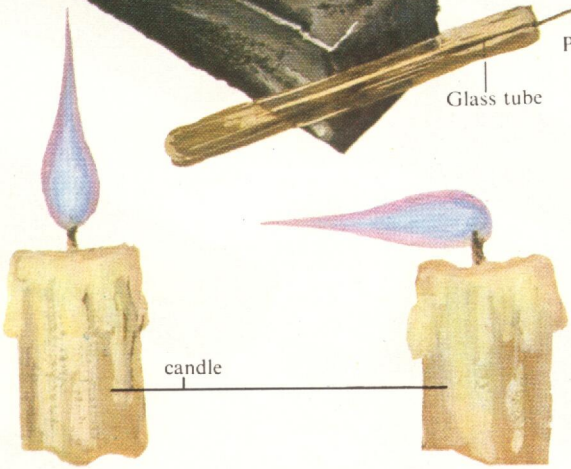
131 Jadeite
34 Jamesonite

105 Kyanite

59 Laumontite
88 Lazurite
39 Lepidolite
77 Lithiophilite
89 Lollingite

62 Magnesite
65 Manganite
119 Marcasite
84 Mesolite
50 Millerite
52 Mimetite
1 Molybdenite
90 Monazite
19 Muscovite





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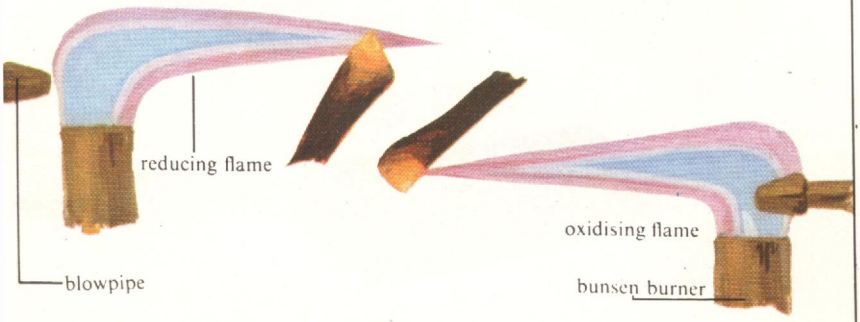
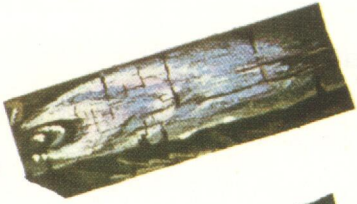
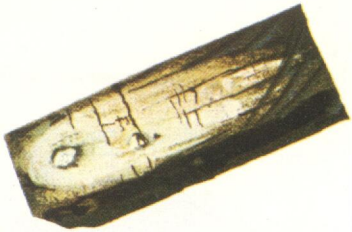
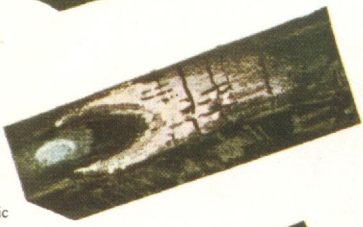




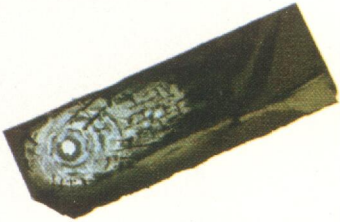
Antimony



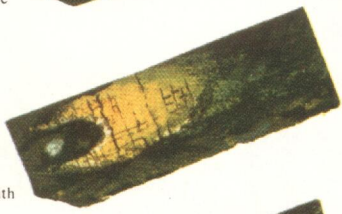
Tin



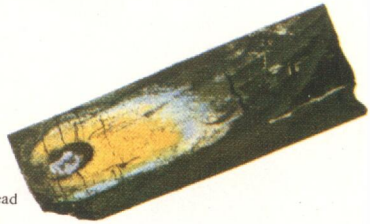
Arsenic



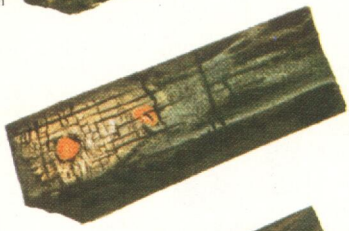
Silver



Bismuth

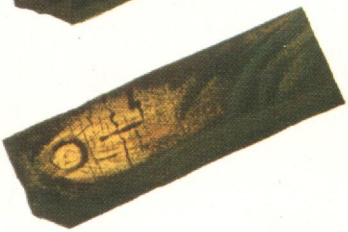


Lead

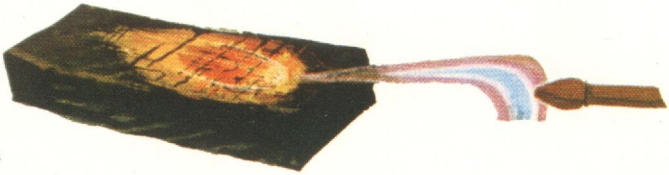


Copper

Zinc



Gold



Charcoal Block Tests

BORAX BEAD TESTS

	OXIDISING FLAME		REDUCING FLAME	
	Hot	Cold	Hot	Cold
Chromium	Yellow	Green	Green	Green
Cobalt	Blue	Blue	Blue	Blue
Copper	Green	Blue	Colourless	Opaque red
Iron	Yellow	Green	Green	Green
Manganese	Violet	Violet to red brown	Colourless	Colourless
Molybdenum	Yellow	Colourless	Brown	Grey to black
Uranium	Yellow, orange red	Yellow to brown	Green	Green to black

MICROCOSMIC SALT BEAD TESTS

	Hot	Cold	Hot	Cold
Chromium	Red	Green	Red Green	Green
Cobalt	Blue	Blue	Blue	Blue
Copper	Green	Blue	Brown	Red
Iron	Brown, red	Brown, yellow	Red	Red to purple
Manganese	Violet	Violet	Colourless	Colourless
Molybdenum	Green	Colourless	Green	Green
Uranium	Yellow	Yellow to green	Yellow, green	Green

▲ Selenite

▼ Wavellite

91 Natrolite
92 Niccolite

112 Opal
7 Orpiment
115 Orthoclase

69 Palladium
120 Petalite
35 Petzite
70 Phillipsite
42 Phosgenite
71 Platinum
121 Prehnite
20 Proustite
102 Psilomelane
36 Pyrargyrite
122 Pyrite
60 Pyromorphite
137 Pyrope G.
4 Pyrophyllite

139 Quartz

8 Realgar

63 Rhodochrosite
113 Rhodonite
66 Riebeckite
124 Rutile

151 Sapphire Ruby
78 Scheelite
93 Scolecite
21 Sepiolite
40 Serpentine
37 Silver
110 Smaltite
111 Sodalite
138 Spessartite G.
148 Spinel
132 Spodumene
67 Stannite
141 Staurolite
22 Stephanite
61 Stilbite
11 Sulphur

2 Talc
118 Tantalite
51 Tetrahedrite

94 Thomsonite
79 Thorite
95 Titanite
149 Topaz
142 Tourmaline
85 Tremolite
116 Turquoise

103 Uraninite
144 Uvarovite G.

9 Vivianite

104 Wernerite
96 Wolframite
80 Wollastonite
44 Wulfenite

73 Xenotine
123 XLS Pyrolusite

145 Zircon
125 Zoisite

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
1	1–1.5	Lead grey	Greenish lead-grey	Metallic	Perfect basal	Scales flexible	4.6–4.75	Molybdenite
2	1–1.5	White, grey, pale green	White	Pearly	Perfect	—	2.7–2.85	Talc
3	1–2	Iron-black, grey-black	Black	Metallic	Perfect	—	2–2.3	Graphite
4	1–2	White, yellow, green	White	Pearly	—	Scales flexible	2.8–2.85	Pyrophyllite
5	1.5–2	Indigo blue	Dark grey to black	Metallic	Perfect basal	Thin plates flexible	4.6–4.76	Covellite
6	1.5–2	Colourless, white, grey, yellow, red	White	Pearly, vitreous	Perfect	—	2.3–2.32	Gypsum
7	1.5–2	Lemon-yellow	Yellow	Pearly	Perfect	Scales flexible	3.49	Orpiment
8	1.5–2	Red, Orange-yellow	Orange or red	Resinous, translucent	Good	Conchoidal	3.56	Realgar
9	1.5–2	Colourless, green, blue	Colourless, white, blue, green	Pearly, vitreous	Perfect	Scales flexible	2.5–2.9	Vivianite
10	1.5–2.5	Crimson, grey, purple, green	Lighter than colour	Pearly, vitreous adamantine	Perfect	Scales flexible	2.95–3.05	Erythrite
11	1.5–2.5	Yellow, yellow-green, yellow-brown	White, pale yellow	Resinous	Imperfect	Conchoidal	2.07	Sulphur
12	2	Light green, blue	Same as colour	Pearly	—	—	3.55–3.65	Aurichalcite
13	2	Light grey, white, yellow tints	Same as colour	Metallic	—	—	6.4–6.9	Bismuthinite
14	2–2.5	Black to lead-grey	Same as colour	Metallic	—	Sub-conchoidal	7.19–7.40	Argentite
15	2–2.5	Silver-white, reddish tints	Same as colour	Metallic	Perfect	Sectile	9.7–9.8	Bismuth
16	2–2.5	Red, brown-red	Scarlet	Adamantine, metallic	Perfect	Sub-conchoidal	8.09	Cinnibar
17	2–2.5	Lead-grey	Grey	Metallic	—	—	8.25–8.45	Hessite
18	2–2.5	White, grey	Same as colour	Dull	—	—	3.5–3.8	Hydrozincite
19	2–2.5	White, yellow, green, brown, black	White	Pearly, vitreous	Perfect	Plates flexible	2.75–3	Muscovite
20	2–2.5	Scarlet	Scarlet	Adamantine	Distinct	Conchoidal	5.55–5.65	Proustite
21	2-2.5	White, grey, yellow tints	White	Earthy	—	—	2	Sepiolite
22	2–2.5	Iron-black	Same as colour	Metallic	—	Uneven	6.2–6.3	Stephanite
23	2–4	Green, blue	White	Vitreous	—	Conchoidal	2–2.5	Chrysocolla

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
24	2.5	Sky blue, greenish	Pale blue	Vitreous	—	Brittle	2.1–2.3	Chalcanthite
25	2.5	White, green, brown	White to pale green	Earthy	Perfect basal	—	2.6–3	Chlorite
26	2.5	White, red, brown	White	Vitreous	Perfect	Uneven	2.45–2.99	Cryolite
27	2.5	Lead-grey	Same as colour	Metallic	Perfect cubic	Flat, even sub-conchoidal	7.5–7.6	Galena
28	2.5	Colourless, yellow, red, purple, blue	Colourless	Vitreous	Perfect cubic	Conchoidal	2.1–2.5	Halite
29	2.5–3	Black, green, brown, red	White	Pearly, vitreous	Perfect basal	—	2.7–3.1	Biotite
30	2.5–3	Pale yellow, silver-white	Yellow to green	Metallic	—	Uneven	9.2–9.26	Calaverite
31	2.5–3	Copper-red, brown	Metallic red	Metallic	—	Hackly	8.9–8.95	Copper
32	2.5–3	Hyacinth-red, deep orange	Orange-yellow	Vitreous, adamantine	Distinct prismatic	Uneven	5.9–6.1	Crocoite
33	2.5–3	Yellow	Yellow	Metallic	—	Hackly	15–19	Gold
34	2.5–3	Dark lead-grey	Grey-black	Metallic	Perfect basal	—	5.5–6	Jamesonite
35	2.5–3	Steel-grey to black	Grey	Metallic	—	Uneven	8.7–9	Petzite
36	2.5–3	Deep red	Red	Adamantine, metallic	Good	Conchoidal	5.7–5.9	Pyrargyrite
37	2.5–3	Silver-white	Same as colour	Metallic	—	Hackly	10.1–11.1	Silver
38	2.5–3.5	White, grey, with red and green tints	White	Pearly, vitreous	Perfect	—	2.35–2.4	Gibbsite
39	2.5–4	White, grey, yellow, red, lilac, purple	White	Pearly	Perfect basal	—	2.8–2.9	Lepidolite
40	2.5–4	Green, brown, black, red, yellow	White	Earthy, greasy	—	Conchoidal	2.5–2.6	Serpentine
41	2.75–3	Colourless tints of white, grey, green, yellow	White	Adamantine, vitreous	—	Conchoidal	6.2–6.39	Anglesite
42	2.75–3	White, grey, yellow, brown	White	Adamantine	—	—	6–6.3	Phosgenite
43	3	Colourless, white, various tints	White	Vitreous, earthy	Perfect	Conchoidal	2.71	Calcite
44	3	Yellow, orange, grey-brown, green, red	White	Adamantine, waxy, resinous	Good	Sub-conchoidal	6.2–7	Wulfenite

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
45	3–3.5	White, grey, blue or red tints	Pale grey	Vitreous, pearly	Perfect	Uneven	2.92–2.97	Anhydrite
46	3–3.5	Bright-green, dark-green, green-black	Apple green	Adamantine, vitreous	Perfect	Conchoidal	3.75–3.76	Atacamite
47	3–3.5	Colourless, white, blue, green, brown	White	Vitreous, pearly	Perfect	Uneven	4.3–4.5	Barite
48	3–3.5	Colourless, white, pale blue	White	Vitreous, pearly	Good to perfect	Uneven	3.96–3.97	Celestite
49	3–3.5	White, grey, various tints	White	Adamantine, vitreous	Distinct	Conchoidal	6.55–6.58	Cerussite
50	3–3.5	Bronze, brassy-yellow	Green-black	Metallic	Perfect	Uneven	5.3–5.6	Millerite
51	3–4.5	Grey, iron-black	Same as colour	Metallic	—	Uneven, sub-conchoidal	4.55–5.1	Tetrahedrite
52	3.5	Shades of yellow, white and brown	White	Resinous	—	Uneven	7–7.3	Mimetite
53	3.5–4	White, grey, red, pink	White	Vitreous, pearly	Distinct	Uneven, sometimes conchoidal	2.55–2.9	Alunite
54	3.5–4	White, grey, various other shades	White	Vitreous, pearly	Perfect	—	2.85–3	Ankerite
55	3.5–4	Colourless, white, various other shades	White to yellow	Vitreous	Distinct	Sub-conchoidal	2.93–3	Aragonite
56	3.5–4	Shades of red to black	Brown, red	Adamantine, earthy, sub-metallic	Poor	Uneven, conchoidal	6–6.1	Cuprite
57	3.5–4	White, black, various colours	Colourless	Vitreous, pearly	Perfect	Conchoidal, uneven	2.8–2.9	Dolomite
58	3.5–4	White, brown, red, white-grey	White	Vitreous, pearly	Perfect	Sub-conchoidal, uneven	2.2	Heulandite
59	3.5–4	White, grey, yellow, red	White	Vitreous, pearly	Perfect	—	2.25–2.35	Laumontite
60	3.5–4	Green, yellow, brown, pink	White, off white	Resinous	—	Sub-conchoidal, uneven	6.5–7.1	Pyromorphite
61	3.5–4	White, yellow, brown, red	White	Vitreous, pearly	Perfect	—	2.1–2.2	Stilbite
62	3.5–4.5	White, grey, yellow, brown	White	Vitreous, earthy	Perfect in crystal form	Flat, conchoidal	3–3.1	Magnesite

4	Colourless, blue, green, yellow, red purple, amethyst	White	Vitreous	Perfect	Conchoidal	3–3.2	Fluorite
4	Steel-grey to black	Red-brown to black	Sub-metallic	—	Uneven	4.3–4.4	Manganite
4	Blue to black	Paler than colour	Vitreous	Perfect	—	3.4–3.44	Riebeckite
4	Steel-grey to black, yellow or blue tinge	Black	Metallic	—	Uneven	4.45	Stannite
4–4.5	Colourless, white, grey	Same as colour	Adamantine, vitreous	Perfect	Hackly	2.42	Colemanite
4–4.5	Silver-white, steel-grey	Steel-grey	Metallic	—	Hackly	11–12	Palladium
4–4.5	White, pink, reddish	White	Vitreous	Not distinct	Uneven	2.2	Phillipsite
4–4.5	Silver-white, steel-grey	Silver-white, steel-grey	Metallic	—	Hackly	14–20	Platinum
4–5	Colourless, white, yellow, pink, red	White	Vitreous, transparent	—	—	2–2.15	Chabazite
4–5	Shades of brown, white, red, yellow	Pale brown, yellow, red	Vitreous, resinous	Perfect	Uneven	4.45–5	Xenotine
4–5	Colourless, white, green, red	White	Vitreous	Easy	Uneven	2–2.2	Gmelinite
4.5–5	Colourless, white, tints of green, pink, yellow	White	Pearly, vitreous	Perfect	Uneven	2.3–2.4	Apophyllite
4.5–5	White, yellow, stains of blue, brown, green	White	Adamantine, vitreous	Perfect	Uneven	3.4–3.5	Calamine
4.5–5	Brown, pink, yellow	Colourless to off-white	Resinous, vitreous	Perfect	Uneven	3.4–3.5	Lithiophilite
4.5–5	White, grey, brown, yellow, green	White	Adamantine, vitreous	Good	Uneven	5.9–6.1	Scheelite
4.5–5	Black, grey, orange	Orange-brown	Vitreous	Perfect	Conchoidal	5.5–6.5	Thorite
4.5–5	White, grey, yellow, red, brown	White	Pearly, vitreous	Perfect	Uneven	2.8–2.9	Wollastonite
5	Colourless, red, blue, green, yellow, brown	White	Vitreous	Poor	Uneven, conchoidal	3–3.5	Chlorapatite

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
82	5	Bright green	Green	Vitreous	Perfect	Uneven, conchoidal	3.2–3.35	Dioptase
83	5	Colourless, red, blue, green, yellow, brown	White	Vitreous	Poor	Uneven, conchoidal	3–3.5	Fluorapatite
84	5	Colourless, white, grey	Colourless	Silky-Vitreous	Perfect	Brittle	2–2.5	Mesolite
85	5	White, grey	White	Vitreous	Perfect	Uneven	2.9–3.25	Tremolite
86	5–5.5	Colourless, white, grey, green	White	Vitreous	—	Sub-conchoidal	2.2–2.3	Analcite
87	5–5.5	Brown, black, red, yellow	Brown-yellow to yellow	Adamantine	Perfect	Uneven	3.3–4.3	Goethite
88	5–5.5	Azure blue	Pale blue	Vitreous	Imperfect	Uneven	2.38–2.45	Lazurite
89	5–5.5	Steel-grey, silver, white	Grey-black	Metallic	Distinct	Uneven	7.1–7.5	Lollingite
90	5–5.5	Yellow, brown, red	White	Resinous	Basal, imperfect, perfect	Conchoidal, uneven	4.5–5.5	Monazite
91	5–5.5	White, red, yellow	White	Vitreous	Perfect	Uneven	2.2–2.25	Natrolite
92	5–5.5	Copper-red	Pale brown, black	Metallic	—	Uneven	7.6–7.8	Niccolite
93	5–5.5	White	White	Vitreous	Perfect	—	2.15–2.4	Scolecite
94	5–5.5	Green, red, white, brown	White	Vitreous, pearly	Perfect	Uneven, sub-conchoidal	2.3–2.4	Thomsonite
95	5–5.5	Brown, green, black, yellow, grey	White	Adamantine, resinous	Good	Uneven	3.4–3.6	Titanite (Sphene)
96	5–5.5	grey-black, red-brown	Dark brown	Sub-metallic	Perfect	Uneven	7–7.5	Wolframite
97	5–6	Colourless, white, green, dark green	White	Vitreous	Good	Uneven	3.2–3.5	Diopside
98	5–6	Steel-grey, black	Brown, rust red	Metallic, earthy	Poor	Uneven, sub-conchoidal	5–5.25	Hematite
99	5–6	Green, green-black, black	Grey-green, brown	Vitreous	Perfect	Uneven	3–3.45	Hornblende
100	5–6	Grey, green, brown, black	Grey	—	Good to perfect	Uneven	3.4–3.5	Hypersthene
101	5–6	Iron-black	Black	Metallic to sub-metallic	—	Conchoidal	4.70	Ilmenite
102	5–6	Iron-black, brown-black, steel-grey	Shiny brown-black, black	Sub-metallic	—	—	4.7	Psilomelane
103	5–6	Grey-green, brown, black	Black, grey, green	Sub-metallic, dull pitch-like, greasy	—	—	7.5–10.5	Uraninite

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
104	5–6	White, pale blue, green, red	White	Pearly, vitreous, resinous	Distinct	Sub-conchoidal	2.65–2.75	Wernerite
105	5–7	White, grey, green, light blue	White	Pearly	Perfect	—	3.5–3.7	Kyanite
106	5.5	Black, brown-black	Brown	Sub-metallic, metallic	—	Uneven	4.5–5	Chromite
107	5.5	Silver, white, grey, reddish tinges	Greyish-black	Metallic	Perfect	Uneven	6.33	Cobaltite
108	5.5	Silver, white, grey	Grey	Metallic	Perfect	Uneven	5.5–5.9	Gersdorffite
109	5.5–6	Silver, white, steel-grey	Dark grey, black	Metallic	Distinct	Uneven	5.9–6.22	Arsenopyrite
110	5.5–6	Tin, white-grey	Grey-black	Metallic	Distinct	Uneven	6–6.5	Smaltite
111	5.5–6	Blue, grey, yellow	White	Vitreous	Distinct	Uneven, conchoidal	2.1–2.3	Sodalite
112	5.5–6.5	Colourless, white, black, brown, various colours and mixtures of colours	White	Vitreous, resinous, pearly	—	Conchoidal	2.2	Opal
113	5.5–6.5	Light red, dark red, pink, brown, yellow, green	White	Vitreous	Perfect	Uneven to conchoidal	3.4–3.7	Rhodonite
114	6	White, grey	White	Vitreous	Good	Uneven	3–3.1	Amblygonite
115	6	Colourless, white, green, grey, red	White	Vitreous, pearly	Perfect	Uneven, conchoidal	2.5–2.6	Orthoclase
116	6	Blue, blue-green, green	White-pale green	Waxy	—	Conchoidal	2.6–2.8	Turquoise
117	6–6.5	White, grey, reddish	White	Vitreous	Perfect	Conchoidal	2.74–2.75	Anorthite
118	6–6.5	Brown, black, grey	red-black	Sub-resinous, sub-metallic	Good	Uneven, sub-conchoidal	5.1–8.0	Columbite Tantalite
119	6–6.5	Brassy-yellow, paler than pyrites	Grey-green to brown-black	Metallic	Distinct	Uneven	4.88–4.9	Marcasite
120	6–6.5	White, grey, green, red	White	Vitreous, pearly	Perfect	Sub-conchoidal	2.39–2.45	Petalite
121	6–6.5	White, grey, yellow, green	White	Vitreous	Good	Uneven	2.8–2.9	Prehnite
122	6–6.5	Brassy-yellow	Green-brown, black	Metallic	—	Uneven, conchoidal	4.8–5.1	Pyrite
123	6–6.5	Steel to iron grey	Black to blue-black	Metallic	Distinct	Brittle, uneven	4.5–5.1	Pyrolusite (XLS)

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
124	6–6.5	Brown, red, yellow, black, blue	Pale brown	Metallic, adamantine	Distinct	Uneven, sub-conchoidal	4.2–4.25	Rutile
125	6–6.5	White, grey, green, yellow, red	White	Vitreous	Perfect	Uneven	3.2–3.4	Zoisite
126	6–7	Black, brown, yellow, red-brown, white	White, grey, brown,	Adamantine	—	Uneven to sub-conchoidal	6.9–7.1	Cassiterite
127	6–7	Tin white	Grey	Metallic	Perfect	—	19–21	Iridosmine
128	6.5–7	Blue, brown, grey, yellow	White	Vitreous	Distinct	Conchoidal	3.28	Axinite
129	6.5–7	White, grey, pink, red	White	Vitreous, pearly	Perfect	Conchoidal	3.3–3.5	Diaspore
130	6.5–7	Black, brown, green	Grey, green	Greasy, vitreous	—	Conchoidal	4–4.5	Gadolinite
131	6.5–7	White shades of green	White	Vitreous	Good	—	3.0	Jadeite
132	6.5–7	White, grey, green, lilac, yellow	White	Pearly, vitreous	—	—	3.1–3.2	Spodumene
133	6.5–7.5	Red-brown, yellow, white, green, orange	White	Vitreous	Good	Sub-conchoidal, uneven	3.2–4.3	Garnet
134	6.5–7.5	Deep red, red-brown	White	Vitreous	Good	Sub-conchoidal, uneven	3.9–4.3	Almandine Garnet
135	6.5–7.5	Yellow, brown, green, green-brown, green-yellow	White	Vitreous	—	Sub-conchoidal, uneven	3.75–3.9	Andradite Garnet
136	6.5–7.5	White, yellow, green, pink, brown	White	Vitreous	—	Sub-conchoidal, uneven	3.5–3.7	Grossularite Garnet
137	6.5–7.5	Deep crimson-red to black	White	Vitreous	—	Sub-conchoidal to uneven	3.6–3.75	Pyrope Garnet
138	6.5–7.5	Orange, dark red, red-brown	White	Vitreous	—	Uneven, conchoidal	4.1–4.3	Spessartite Garnet
139	7	Colourless, white and all colours	White	Vitreous	—	Conchoidal	2.65	Quartz
140	7–7.5	Colourless, yellow, brown	White	Greasy, vitreous	—	—	2.97–3.02	Danburite
141	7–7.5	Brown, red-brown, brown-black	Grey	Resinous, sub-vitreous	—	Conchoidal	3.45–3.8	Staurolite

No.	Hardness	Colour	Streak	Lustre	Cleavage	Fracture	sp/sg	Name
142	7–7.5	Black, brown, red, blue-green mixed	White	Vitreous	Difficult	Sub-conchoidal	2.98–3.2	Tourmaline
143	7.5	Colourless, white, grey, green	White	Vitreous	Poor	Uneven	3.2	Andalusite
144	7.5	Emerald-green	White, greenish	Vitreous	—	Sub-conchoidal	3.4–3.5	Uvarovite Garnet
145	7.5	Colourless, orange, red, grey, green, yellow, violet	White	Adamantine	—	Conchoidal	4.7	Zircon
146	7.5–8	Colourless, white, pale green, emerald-green, blue, yellow, golden	White	Vitreous, resinous	—	Conchoidal	2.6–2.9	Beryl
147	7.5–8	Green, yellow, brown, black	Grey	Vitreous	—	—	4–4.6	Gahnite
148	8	Yellow, green, black, brown, red, blue	White or body colour of mineral	Vitreous	—	Conchoidal	3.5–4.1	Spinel
149	8	Colourless, blue, yellow, golden-yellow, red-brown, gold-brown	White	Vitreous	Perfect	Conchoidal	3.5–3.6	Topaz
150	8.5	Green, green-yellow, yellow, golden	White	Vitreous	Distinct	Conchoidal, uneven	3.6–3.85	Chrysoberyl Alexandrite
151	9	Grey, Colourless, blue-green, golden, pink, red, brown, purple, partly coloured	White	Vitreous, adamantine	—	Conchoidal, uneven	3.9–4.1	Corundum Sapphire Ruby
152	10	Colourless, blue-white, blue, yellow, pink, brown, orange, green, black, red, purple	Nil	Adamantine	Perfect	Conchoidal	3.5	Diamond Bort Boart Carbonado

Chapter 4

SIMPLE CHEMICAL TESTS FOR IDENTIFICATION

The following tests illustrate how easy it is to identify collected mineral specimens by chemical means. These tests only require simple apparatus and readily available chemicals. Tests for gold, platinum, silver, copper, nickel, tin and lead are described.

Test for Gold

The items required are a spirit lamp or bunsen burner, clean test tube, aqua regia, blotting or filter paper and stannous-chloride. Aqua regia is an acid that dissolves gold. It is prepared by mixing one part of nitric acid with three parts hydrochloric acid both of which are undiluted.

Stannous chloride is prepared by boiling tin powder in hydrochloric acid. Place a small amount of the mineral thought to be gold into a clean test tube and add aqua regia. Boil gently for two to three minutes. Any gold present will now have dissolved in the acid.

Cool and take a piece of blotting paper, put two drops of the above solution onto the centre of the paper and one drop of stannous chloride solution. If gold is present a purple to red stain will appear. Inspect the dish in which the gold was washed. Any small heavy silvery-white grains may be platinum. Dull metallic white grains could be osmiridium.

Test for Platinum

The particles thought to be platinum should be dissolved in aqua regia. This is done in an evaporating dish. Evaporate to dryness and further heat until all fumes have disappeared. Dissolve the residue in a small amount of water and filter it. A few drops of potassium iodide are then added to this filtered solution. If platinum is present the deep red colour of platinum iodide will be seen.

Another test for platinum may be carried out. Boil particles thought to be platinum in aqua regia and so dissolve them. The solution will probably be a yellow colour. Add a few drops of stannous chloride solution and if platinum is present, a deep red solution will result. If, after boiling, the solution in aqua regia some steel-grey or metallic-white particles remain; these are probably osmium or osmiridium.

Test for Silver

Finely powder the ore to be tested. Mix a solution of one-third

concentrated nitric acid and two-thirds distilled water (always add acid slowly to the water). Add a small amount of finely powdered mineral and heat over a flame to boiling point. This will allow any silver to dissolve. When cool, add a small amount of hydrochloric acid.

If a white precipitate forms it may be either lead chloride or silver chloride. Filter the solution and remove the sediment from the filter paper. Place the sediment in a clean test tube and add ammonia. The ammonia will dissolve the silver chloride leaving the lead chloride if present. Filter once more to remove the lead chloride. Place the filtered solution in a test tube and add a small amount of hydrochloric acid. The silver chloride will then be re-precipitated as a white curdy mass.

Test for Copper

(i) *Flame Test for Copper*

Take a chip of mineral thought to contain copper and moisten it with nitric acid. Using tweezers, hold the chip in a flame. A vivid green colouration will indicate the presence of copper.

(ii) *Wet Test for Copper*

Powder the mineral and place it in a test tube. Add nitric acid and boil for several minutes. Carefully add water to double the quantity in tube. Allow the solution to cool and then add a few drops of ammonia. If copper is present a blue solution will form. Nickel may also produce a blue coloured solution so, as a further check place a new nail in the liquid. If copper is present, the nail will become coated with a bright copper deposit.

A red or brown deposit formed in the bottom of the tube would be iron which is removed by filtering.

Test for Nickel

If the copper test reveals possible traces of nickel, filter the solution to remove iron and then add a few drops of dimethylglyoxime solution. If nickel is present a red solution will result; if left to stand a red precipitate may form.

If you wish only to carry out a test for nickel, the same procedure as that for copper may be used. Filter to remove any iron and test with dimethylglyoxime.

NOTE: Dimethylglyoxime Solution is made by dissolving Dimethylglyoxime in alcohol.

Test for Tin

The mineral believed to contain tin is powdered (approx. ¼ teaspoon) and mixed with an equal amount of zinc powder. It is then placed in a test tube with approximately eight to ten drops of hydrochloric

acid and boiled. Allow to cool and place two or three drops of the solution into another tube. Add one or two drops of cacothelin* solution. If tin is present a red lavender or purple solution will result.

Occasionally, when prospecting, heavy grains will appear in the dish. These may be brown or a black colour, and more rarely red or white. They could be cassiterite (tin oxide) and the test is as follows: Place equal quantities of the grains and powdered zinc in a test tube and slowly add twice the volume of hydrochloric acid. If cassiterite is present, after three to four minutes the grains will become coated with silvery-white-metallic tin.

Test for Lead

Powder the ore to be tested. Take approximately half a teaspoon of the powder and place it in an evaporating dish. Add an equal volume of nitric acid and stand for a few minutes then add ten cubic centimetres of cold water. Shake this solution and add a small amount of potassium iodide. If lead is present a yellow *precipitate* results.

The above tests can be simply performed by the amateur prospector. They do not require complicated equipment or any advanced knowledge of chemistry. Tests for less commonly found minerals may be found in more advanced publications. It is advisable to carry out tests on positively identified samples, so as to become familiar with the various reactions each mineral will bring about.

All chemicals and equipment for testing can be obtained from Genery's Scientific Equipment Supply, 183 Little Collins St., Melbourne, Vic. 3000.

* Cacothelin solution is made by dissolving cacothelin in water.

Chapter 5

PROSPECTING

Prospecting is a science of practical observation and experience. Inexperienced prospectors should be aware of simple techniques necessary for identifying rocks and minerals in the field.

The prospector should be able to identify any material he sees, noting in a field book such particulars as rock type surrounding mineral vein, rocks found adjacent to vein or position on map. These notes will be invaluable when later tracing the extent of a mineral deposit.

As much information as possible must be collected on the area to be inspected. Army Survey maps, geological notes and maps and aerial photographs are useful. The boundaries of the area to be investigated should be defined on a map. When a metallic substance is found, note the position and extent of the material. If immediate and accurate identification is not possible a sample of unweathered material should be collected and labelled. By noting hardness, colour, streak and specific gravity and performing the tests described in Chapter 3 the prospector will be able to identify most minerals he finds and with experience should be able to immediately recognize minerals, in any form.

Prospecting in Alluvial Deposits

Some of the most valuable concentrations of minerals have been mined from alluvial deposits—gold, platinum, tin, silver, diamonds, sapphires are found in them. These deposits are of two types: shallow alluvial deposits (shallow placers) and deep leads.

SHALLOW PLACERS are recent deposits of loose material such as sand or gravel lying on the surface of other rocks. They are simply the accumulation of debris resulting from weathering and erosion of rocks and washed down from a parent formation at higher levels.

Such deposits containing the denser minerals will be found richest where the current of the stream depositing them is momentarily obstructed, e.g. by bars crossing the stream at right angles, hollows in the bed of the stream and curves in the stream.

DEEP LEADS are alluvial deposits buried beneath hundreds of feet of consolidated sedimentary rocks or soil, or igneous rocks. In some cases later earth movements have pushed these leads closer to the surface. However, exploring deep leads is an expensive operation, therefore most prospectors are restricted to the reworking of mullock heaps deposited from mines working these deep leads.

Testing Alluvial Deposits

PANNING is agitating sands and gravels with water in a shallow pan so that the lighter materials are washed away, leaving the heavy minerals in the pan.

A gold pan is iron, flat-bottomed, and with sides sloping at a 45° angle. Near the lip is a shallow depression which goes part way round the pan—this lip traps the heavy particles in the sample. Care should be taken to keep the pan clean and free from rust and dents.

Method

To pan for high density minerals, half fill the dish with the material to be examined, and immerse it in the stream. Allowing the water to flow over the lip, the material should be agitated to separate the clay from the gravel. Taking the pan in both hands and using a circular motion allow the water to swill over the gravel in the pan, dipping the lip occasionally to allow the lighter material to wash over the lip. Large stones are removed by hand. This swilling is continued as the quantity of material decreases and the heavier particles work to the bottom of the pan. The lighter material is allowed to escape over the lip. When the pan contents are eventually reduced to a thin layer, allow a small amount of water to spread these concentrates across the bottom of the dish.

Care should be taken in the final stages of removing sand from the gold particles or other valuable concentrates. The shallow depression around the pan is used to trap these minerals. An experienced prospector will realize that gold is not always yellow, but may be coated with other material, such as iron. Similarly, worthless looking black sands may be granules of tin. The amateur should, therefore, be aware of the varying appearances of valuable minerals.

SIEVING This method of separation is based on the simple principle that when ungraded gravel is put into water, the heavier particles sink before the lighter particles.

A sieve is a sorting utensil with a network or perforated bottom through which liquids or fine particles can pass while solid or coarser matter is retained. Two sieves are needed: one of $\frac{1}{4}$-inch mesh $\frac{1}{4}$ square and one of $\frac{1}{8}$-inch $\frac{1}{8}$ square. Such sieves are used so that the gravel being worked is of a reasonably uniform size: thus the smaller material in the bottom sieve is not disturbed by larger pieces of stone.

Fortunately for the fossicker, the most sought after gems are of a high specific gravity in comparison to the gravels in which they are found. It is important to choose the appropriate type of sieves. Experience has shown that the most useful is the circular wooden garden sieve. This type is large enough to enable the operator to process a sufficient amount of gravel, and it has deep sides so that

little is spilt and lost. The wood used in the construction imparts a certain amount of buoyancy to the sieve, making the work less strenuous.

Sufficient water is needed to submerge the $\frac{1}{8}$-inch mesh sieve and partially submerge the $\frac{1}{4}$-inch mesh sieve which stands on top of the other. The screen of the upper sieve should be submerged but if there is insufficient water in the area, a cut down water tank is an ideal substitute tub when filled with water.

In order to process the gravel the larger meshed sieve should be placed on top of the smaller. The gravel is then shovelled into the uppermost sieve and agitated to allow the finer material to drop through into the bottom sieve. When the lower sieve is half-full the top sieve should be checked for larger gems, before the material is discarded.

Taking the bottom sieve with the contents still below water, a vigorous shaking should cause all the material finer than $\frac{1}{8}$-inch square to pass through the sieve. The sieve will now be seen to contain minus $\frac{1}{4}$-inch and plus $\frac{1}{8}$-inch material.

With the sieve resting on the fingers at opposite sides of the dish, and the gravel just submerged the operator should begin the final sorting process. Moving the sieve in a jerky motion up and down in the water allows the gravel to be suspended on the downward stroke and arrested on the upward. The sieve should be rotated gently during this operation. The heavy material, as a result of this process, will be concentrated at the bottom of the sieve. With the gravel still submerged, a brisk shake from left to right should leave a pile of gravel running across the centre of the sieve with the heavy material undisturbed beneath. Another brisk shake toward and away from the operator should produce a circular pile of gravel in the centre of the sieve still with the heavier material at the bottom.

This sieving cycle should be repeated several times. The final steps consist of shaking the sieve up and down for several strokes before draining off all surplus water.

The appearance of the sieve contents will now reveal the efficiency of the operator. Looking from beneath the sieve there should appear a dark circular patch of heavy particles in the centre of the mesh. All material around this heavy circular patch must be removed.

Again placing the sieve in the water with the $\frac{1}{4}$-inch mesh sieve on top of it, more gravel should be added to repeat the entire cycle two or three times. No gravel should be removed from the lower sieve at the completion of the final cycle. A hessian bag or sand bank is ideal for a flat bed on which to place the sieve contents.

The sieve is inclined to drain off water then flipped over on the prepared bed. In the centre will be a circular patch of heavy minerals,

▲ Crocoite

▼ Asbestos

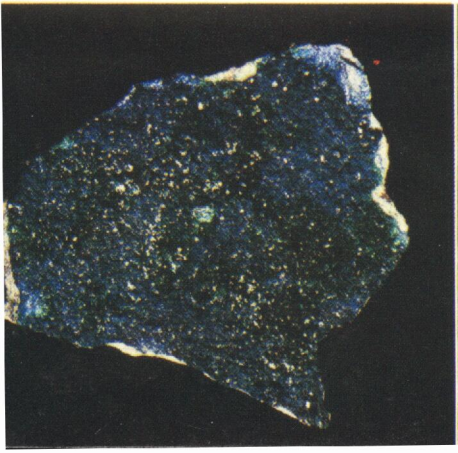
Tetrahedrite B.H.P.

Rhodorite B.H.P.

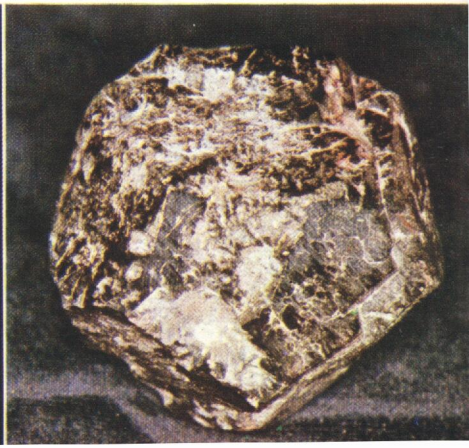
Flouritic ore B.H.P.

Erythrite

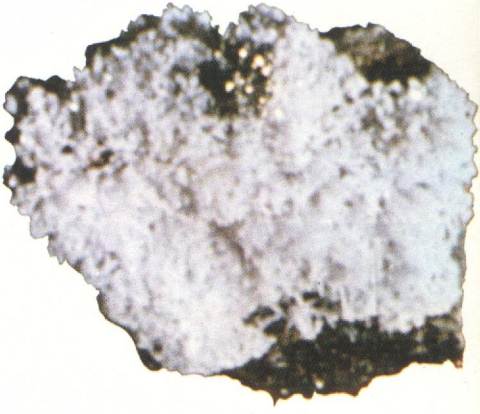
▼ Azurite & Malachite



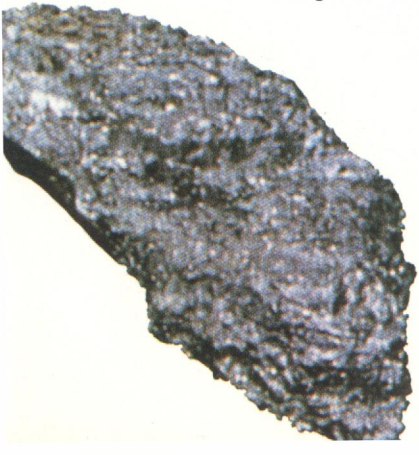
▼ Pyrite



Malachite & Sulphicles B.H.P.



Marmatite B.H.P. ▼ Lollingite B.H.P. Pyrite Crystals B.H.P. ▼ Inesite B.H.P.



▲ Cuprite

▼ Malachite & Cerussite

possibly including iron stone, tin, gemstones, or even a small nugget of gold.

A beginner wishing to check his efficiency at sieving may find it helpful to add lead shot to the gravel being worked. If this heavy material is recovered, then the operator knows he has been successful.

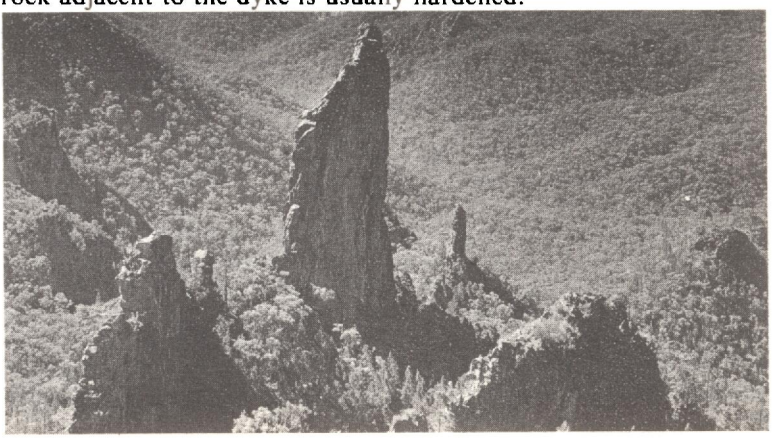
Mineral Veins and Deposits

OUTCROP That part of an ore body exposed on the land surface is known as an outcrop. In some instances an outcrop may appear as an entirely different formation to those rocks occurring on either side of it, e.g. the original Broken Hill lode. In other circumstances an outcrop may be a mineralized zone at the same level as the surrounding rock.

VEINS These intrusions are usually of igneous origin (in the ultimate analysis) and usually consist of a single mineral (e.g. quartz or calcite) or an ore. Veins are deposits which have filled cracks and fissures formed in the earth's structure during cooling. Material filling these fissures may have been forced from below, deposited from super-heated vapours or deposited from solutions.

DYKES Dykes are formed in much the same way as veins. They are usually a wall-like intrusion of igneous rock injected into a fissure and cutting through the structure of the rocks they intrude. Usually larger than veins the dyke varies from a few inches to several hundred feet thick and may be many miles in length. Dykes are nearly always vertical with roughly parallel walls.

The surrounding rock may be changed near the point of contact with the dyke due to the action of heat (METAMORPHISM). The rock adjacent to the dyke is usually hardened.



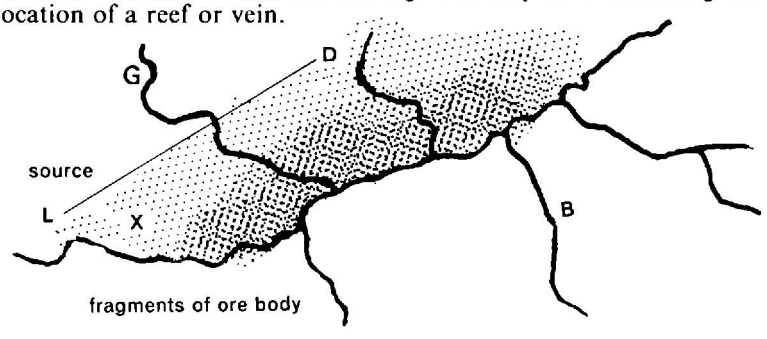
Most dykes are harder than the surrounding rock and so may stand above the surface like a wall. In other cases a dyke may be softer than the surrounding rock and weather leaving a trench-like formation. Pegmatite dykes are an especially important type of dyke to the prospector as many minerals and gems are found in them.

SILLS These wide, thin intrusive igneous bodies are similar to dykes except that while dykes cut across the country rock formation, sills form parallel to the formation and are usually between different layers of the original rock. Rocks adjacent to the sill may also show metamorphism.

Prospecting for Mineral Veins

LOAMING The strongest evidence for the presence of a mineral vein in the vicinity is the appearance of fragments of the ore body scattered down hillsides and over valley floors. If anything of value is found in fragments, the prospector should trace the material up the valley to its source. Loaming is tracing alluvial minerals back to their source by systematically collecting surface samples and panning these for traces of the mineral. Thus it involves the thorough checking of all tributary and main streams in the area for mineral fragments.

A sketch map of the area marking in the tributaries and detailing them as 'barren' or 'mineral-bearing' will help in determining the location of a reef or vein.



In the above diagram, the creeks marked 'B' are barren of minerals. The shaded areas and the creeks marked 'G' show traces of mineral. In the lightly shaded area (X) traces of mineral were found in the soil. From such a situation the prospector can expect to find a quartz reef along the line L - - - - D. It was possibly from this reef that the mineral was shed. In order to positively identify the reef as the mineral bearer portions of it should be uncovered in trenches, with the samples crushed and panned.

Ultra-Violet Light in Prospecting for Fluorescent Minerals

Ultra-violet light is also known as black light and is invisible. Some minerals absorb this invisible light and emit light of another wave length visible to the human eye. Thus a piece of white calcite may become vivid red when subjected to ultra-violet light. Scheelite will possibly show a vivid blue; sphalerite may become deep orange. Cream-coloured secondary zinc ore may be bright yellow. This effect is known as *fluorescence* named after the mineral fluorite which is one of the more common fluorescent minerals. Thus *fluorescence* is the emission of visible light by a substance exposed to ultra-violet light.

There are several sources of ultra-violet light available for the study of fluorescence in minerals. Some minerals fluoresce in the long wave and a suitable ultra-violet light source is the Philips tube which fits into a normal fluorescent light holder. This is available in 20 watt, two-foot tube or 40 watt, four-foot tube and is in the T.L. Black light series.

For minerals in the short wave a mercury vapour germicidal lamp is used but a special filter glass must be fitted to exclude all visible light.

There are small ultra-violet lamps on sale which emit either long or short waves and these are useful in the field.

Displays of fluorescent minerals may be seen at museums in most states.

Some minerals will continue to emit light after the ultra-violet source has been removed. This is known as *phosphorescence*. Others will emit visible light when heated and so are called *thermo-luminescent*. Fluorescent light is used extensively in prospecting for scheelite and the ore recovered can be graded by the same means.

Chapter 6

COLLECTING AND DISPLAYING MINERALS

A keen collector will find that his collection quickly grows, and does not necessarily involve a great deal of expense. Specimens of inferior quality collected at an early stage will gradually be replaced by better samples; however, any specimens are valuable in giving a reliable record of the locality at which they were found. In most districts, minerals can be collected or purchased from quarrymen or miners. Others may be acquired by exchange with other collectors, or from mineral dealers. The object of collecting is not merely to have an increasing quantity of minerals, but to supply the collector with materials which will always be at hand for study and comparison. Those interested in minerals should never miss an opportunity to inspect another collection.

The cleaning, labelling and setting-out of the specimens in a collection is important. There are few rules to apply and much is left to individual taste and judgement.

Cleaning and Packing of Specimens

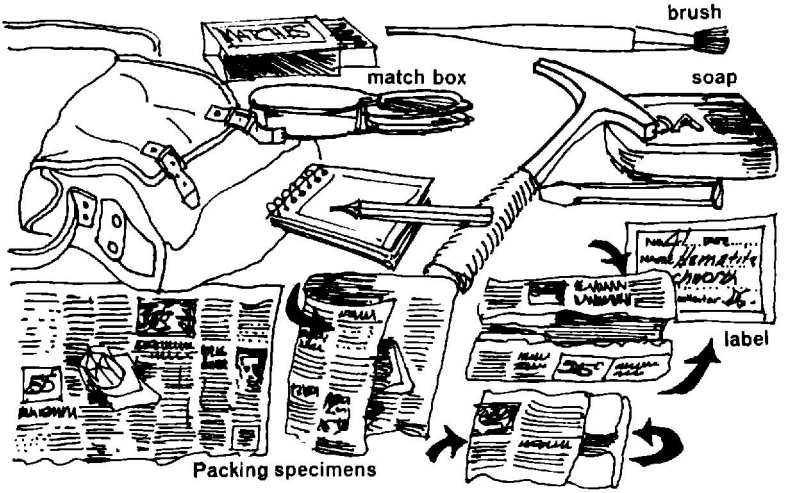
For cleaning and dusting the specimens, a soft painter's brush with short, stiff bristles is useful. In many cases the specimens can be washed in water; but care should be taken not to use hot water as cleavage cracks may develop in the crystals. A lather of soap can be applied with a soft shaving-brush; and some specimens can be scrubbed with a hard nail-brush. The use of acids should be avoided as some minerals may decompose or tarnish.

Specimens can be trimmed to a suitable and presentable shape with a small hammer. Great care is required, for the crystal surfaces are easily fractured along their cleavage planes.

Crystals should stand out from the matrix (rock which contains the crystals); but often the specimens are reduced to too small a size, or the crystals are detached from their matrix: both mistakes should be avoided. The associated minerals should always be preserved, as they tell much of the origin of the specimen at hand.

Care must be taken that the specimens do not damage each other as the edges of the crystal will easily bruise and ruin the specimen. To avoid damage, each specimen should be carefully placed in a separate container. The inner part of a match-box serves this purpose; or trays can be easily made out of cardboard pasted round with paper. The card-trays should be of such a size that when placed in rows they exactly fill the drawer: thus preventing any movement.

The depth of the trays may be $\frac{1}{2}$–$\frac{3}{4}$ inch. Small isolated crystals are conveniently kept in corked glass-tubes.



Labelling

Each specimen in the collection should be accompanied by a label. On this should be recorded the name of the mineral, the locality where found, the source of the specimen, the name of collector or donor, and the date. Further information may be given about any associated minerals present on the specimen, or the forms of the crystals and the mode of occurrence. Loose labels are best attached to the specimen to avoid mixing. Specimen labels may alternatively just show a number with the details catalogued elsewhere.

An attempt should be made to represent at least the more important varieties of each species, its different forms of crystals, modes of occurrence and associations. The common or massive forms of a mineral should be represented in addition to rare crystal forms. The classification followed may be taken from official textbooks; and it is extremely instructive to re-arrange the collection according to different systems of classification. The subdivision of each species is best made according to the localities where the specimens were found, commencing with those nearest home. But when the collection has grown, the collector will find himself compelled to specialize in certain lines. He may then restrict his collection to the minerals of a particular district or country, to certain groups of minerals, or even to a single species; an exhaustive collection of calcite, for example, might fill a whole museum.

Equipment

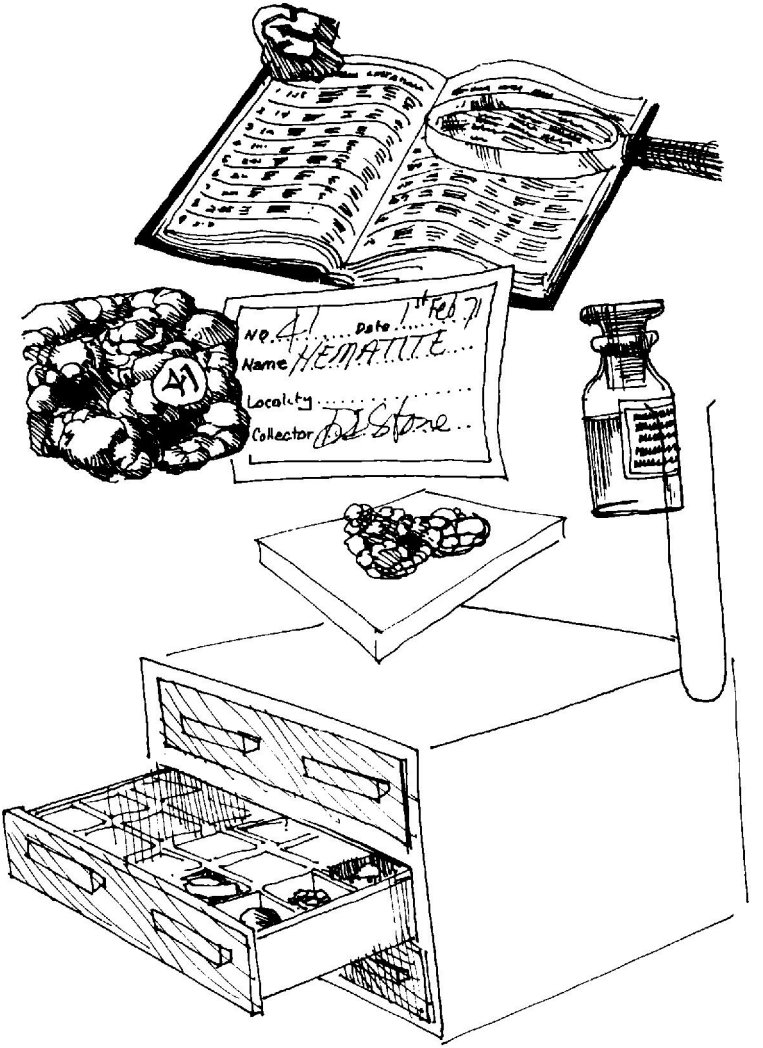
When setting out to collect minerals in the field certain essential equipment must be carried. At least two hammers are required—one weighing about 1½ pounds (geological hammer) for ordinary use and a smaller one of a few ounces for trimming specimens. A chisel with a hard edge is also required. A sledge-hammer is often useful for breaking large blocks of rock. Other items include a canvas collecting-bag with several pockets, a magnifying glass, a note-book and plenty of packing material. An acid bottle can be of assistance in recognizing carbonate minerals and limestone rocks.

Packing Minerals

Old newspapers are best for packing minerals, and small boxes should be carried for any especially delicate specimens found. The specimens must not be allowed to rub against one another in the collecting-bag, so each must be carefully and separately wrapped. At the same time a temporary label, indicating the spot where the specimen was found, should be enclosed in the wrapping. Some collectors prefer to mark a number on the specimen or on the wrapping, and make a corresponding entry in a note-book. When several specimens are collected at the same spot these may be conveniently placed together in a paper bag with a note on the bag, each specimen separately wrapped.

When the collector returns home, he should carefully examine the specimens. Before the specimens can be completely labelled the minerals present must be identified. This is done by noting their physical characteristics such as crystal form, hardness, cleavage or streak. For more elaborate testing for identification, bead and blowpipe tests are useful. Make reference to the identification tables.

Only in exceptional cases are mineral specimens of any value found among the weathered materials on the surface of the ground. Search must be made in areas where unweathered rocks are exposed such as in mines, pits, quarries and cuttings. Good specimens are often to be found on the mullock heaps from metalliferous mines. It is mostly amongst the older sedimentary rocks and those of igneous and metamorphic origin that crystallized minerals are to be found.


No. 41 Date 1st Feb 71
Name HEMATITE
Locality
Collector D.J. Stone
41

Chapter 7

WHERE TO FIND MINERALS

Prospectors are encouraged to look for minerals in new areas as well as in the known places. In order to encourage this type of prospecting the principal minerals to be found and the areas of their location in each State have been listed in the tables which follow under the headings:

Mineral and Location; Description of Deposits.

It is also suggested that mineral hunters acquire an elementary knowledge of the geology of the areas in which they wish to go prospecting. This will enable the collector to locate the various areas in which minerals are to be found.

After an area has been selected, the prospector should obtain a set of Geological Survey Maps and military maps, scale 1 inch to 1 mile (1 : 63,360) of that particular area and its surroundings. These maps are invaluable guides as they show towns, roads, rivers, creeks and likely sources of minerals, plus other relevant information for the trip. They will also help the prospector in the choice of new areas for possible mineral searching.

VICTORIA

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Antimony	
Costerfield mines, 30 m. ESE of Bendigo.	Important producer between 1862 to 1951. Auriferous antimony deposits occur along a belt 10 miles long, but nearly all the production came from the Costerfield and nearby Bombay mines. The deposits occur in folded mudstones. Most of the antimony reefs carry two to three ounces of gold per ton.
Coimadai, 9 m. NNE of Bacchus Marsh.	Two lodes consist of quartz and antimony veins in faults and sheared sandstone and slate intruded by felspar porphyry.
Small amounts of antimony reported from Tallandoon, 22 m. S of Tallangatta; Kevington, 20 m. S of Mansfield; Bailieston, 20 m. NE of Costerfield; Clonbinane, 30 m. N of Melbourne; Ringwood; Steels Ck.	
Barite	
Butcher's Ridge, 1½ m. E of Buchan-Gelantipy Rd; 5 m. S of Gelantipy, East Gippsland.	Occurs in a vein 500 ft. long, with an average width of 4 ft. The surface material is stained, deeper material is of a higher quality.
Good Hope Silver Mine, S Buchan, 1 m. SW of Gelantipy; in vicinity of Glen Shiel Silver Mine at East Gelantipy.	Deposits are small and of poor quality.
Dookie, 23 m. NW of Benalla; Walwa, 20 m. NW of Corryong; Erinundra, abt 30 m. NE of Orbost; Deddick R., 20 m. NE of Gelantipy; the Upper Gellibrand R., 3 m. E of Barramunga, abt 20 m. N of Cape Otway.	
Bauxite	
Boolarra, in Buln Buln County, 75 m. ESE of Melbourne.	Forty small deposits—less than a dozen are of workable size, occur within an area of 200 sq. m. The bauxite is overlain by clay, sand and gravel. The deposits are associated with faults, occurring where the sediments have been down faulted against Eocene basalt, and have formed by bauxitization of the basalt. The bauxite has little resemblance to other Australian bauxites. The colour is commonly light shades of grey, buff, cream or brown.
Bismuth	
No production of bismuth is recorded since 1916 when a small quantity was extracted as a by-product of wolfram mining at Mt Bendoc, 30 m. SW of Bombala, NSW.	
Chromite	
Thiele's Ck., 120 m. E of Melbourne.	Small deposits occur in serpentine.
Howqua R., 12 m. S of Mansfield.	Chromite has been reported, being associated with the Cambrian diabase.
Tatong, 16 m. SE of Benalla.	Chromite has been reported.
Dookie, 36 m. W of Wangaratta.	Chromite has been reported.
Mt Stavely, 26 m. SSW of Ararat.	Chromite has been reported.
Cobalt	
Chief ore minerals of cobalt are smaltite, cobaltite, erythrite and asbolite.	
Tanjil, 70 m. ESE of Melbourne.	Asbolite has been reported.
Thompson R. Copper Mine, 15 m. NE of Tanjil.	Cobalt has been reported.
Bulumwaal, 14 m. NNW of Bairnsdale.	Cobalt has been reported.
Copper	
Cooper's Ck. Copper Mine on the Thompson R., 3 m. SW of Walhalla, which is 80 m. E of Melbourne.	At the outcrop the orebody is about 120 ft. long and 25 ft wide, and is associated with a diorite dyke. Gold, silver and palladium was also reported.
Bethanga, 12 m. E of Albury.	Small sulphide fissure lodes occur.
Accommodation Ck., which flows into the Deddick R., 5 m. E of Snowy R. junction; abt 43 m. N of Orbost.	

VICTORIA

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Corundum	
Mt Wellington area, 30 m. N of Heyfield.	Associated with serpentine.
Woolshed Ck., near Beechworth.	Small well-rounded pebbles in the alluviums of Woolshed Ck.
Diamonds	
Balmoral district (Mather's Ck.).	In gold drifts.
Beechworth.	In gold drifts.
Chiltern.	In gold drifts.
Mansfield.	In gold drifts.
Gold	
Principal fields are to the NW and W of Melbourne, grouped into a series of belts, trending about NS. From W to E the belts are Stawell-Ararat, Pyrenees, Ballarat-Wedderburn, Steiglitz-Maldon, Blackwood-Bendigo, Lauriston-Taradale. The principal fields in this region were: Bendigo and Castlemaine in the Blackwood-Bendigo belt, and Ballarat and Clunes in the Ballarat-Wedderburn belt.	The primary deposits are generally similar, comprising quartz reefs in Lower Ordovician, commonly closely folded, slates. The strike of most of the reefs is the same as that of bedding, and saddle reefs at the crest of anticlines are prevalent.
To the N, NE and E of Melbourne, the fields comprise two belts: Warrandyte-Rushworth, trending a few degrees W of N, and Walhalla-Gaffney's Ck., trending NW.	The deposits are mainly in Silurian rocks.
Further E again, the fields are scattered, but many can be grouped into two roughly-parallel belts, abt 25 m. apart and trending NNW, Dargo-Beechworth and Cassilis-Bethanga.	These eastern fields are in Upper Ordovician sediments or the Devonian Snowy River Porphyries.
Gypsum	
Nowingi West, abt 30 m. SW of Mildura.	A deposit known as Raak Plain occupies an area from 3 to 5 m. wide and abt 12 m. long. The grade of the gypsum ranges from 70% to 96% gypsum.
Kow Plains situated N of the Ouyen-Murrayville rlwy line, near Cowangie, covers an area of 45 sq. m. of low hills and flats.	Gypsum deposits cover an area of abt 3 sq. m.
Yatpool on the Mildura rlwy line.	Large deposits covering an area of approx. 17 sq. m.
Ned's Corner station.	Other localities where gypsum has been reported.
Boort, 40 m. N of Bendigo; Woorinen, 6 m. NW and Waitchie, 26 m. W of Swan Hill.	Other localities where gypsum has been reported.
Tempy, Gypsum, Siding and Bronzewing, 40, 20, 16, and 9 m. respectively SSE of Ouyen.	Other localities where gypsum has been reported.
Yaapeet, 50 m. SSW of Ouyen; Nypo, 4 m. NNW of Yaapeet; Hattah, 21 m. N of Ouyen; Murrayville, 68 m. E of Ouyen.	Other localities where gypsum has been reported.
Heavy Minerals & Beach Sands	
Zircon, Rutile, Ilmenite, Monazite	
Acheron R., 45 m. ENE of Melbourne.	In the Acheron R. valley a series of bores were put down over 400 acres. These indicated the presence of 9,000,000 cubic yards of dredging ground with an average heavy mineral content of nearly 40 lb. per cu. yd.
Heavy mineral deposits have been reported from the following locations: Anglesea; Betka R. near Mallacoota Inlet; Cape Everard; Parish of Jindivick; Port Phillip Bay.	
Iron	
Principle sources of iron are oxides of hematite, magnetite, goethite and limonite.	
Nowa Nowa in E Vic.	The ore consists of massive and micaceous hematite at the surface, passing into magnetite with micaceous hematite, pyrite and chalcopyrite.
Buchan district, abt 20 m. N of Nowa Nowa.	Deposits of limonite are associated with the limestone.
Casterton, SW Vic.	Iron has been reported.
Mirboo North, 20 m. SW of Yallourn; Lal Lal, 12 m. SE of Ballarat.	Iron has been reported.

VICTORIA

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Lead and Zinc	
Buchan 20 m. NW of Orbost (lead and gold).	Lenses and stringers of galena in limestone.
Mount Deddick 30 m. NNE of Buchan (lead).	Lenses of galena in quartz veins and crushed granite.
Omeo (lead).	As complex sulphide ores.
Pine Mountain near Walwa (galena).	Associated with fluorspar in fluorspar workings.
Sandy Ck. near Walwa (galena).	Associated with fluorspar in fluorspar workings.
Manganese	
Heathcote, 60 m. N of Melbourne.	Extensive manganese orebody with a high iron content occurs.
Nowa Nowa; Mt Tara and Jackson's Crossing nr Buchan in E Gippsland.	Small deposits of manganese occur.
Mercury	
chief ore mineral of mercury is cinnabar.	
15½ m. upstream from Jamieson on Silver Ck., 72 m. ENE of Melbourne.	A little free mercury and cinnabar occurs in small quartz leaders in slate and sandstone.
Molybdenite	
Deposits occur 2½ m. NE of Everton, which is 13 m. E of Wangaratta.	
Mt Douglas, 36 m. NW of Bendigo.	Occurs in numerous thin quartz veins in granite.
Thologolong, 35 m. E of Albury.	By product of wolfram mining.
Simmon's Gap, 12 m. SE of Bright.	Molybdenite has been reported.
Moliagul, 12 m. N of Dunolly.	Molybdenite has been reported.
Nickel	
Thompson R. Copper Mine in the Walhalla District 85 m. E of Melbourne.	Nickel is associated with the copper ore at the junction of Cooper's Ck., and the Thompson R.
Bullumwaal, 14 m. NNW of Bairnsdale.	A cobalt ore containing nickel was reported.
Platinum & Palladium	
Thompson R. Copper Mine, abt 3 m. SW of Walhalla.	The platinum is associated with copper in a hornblende dyke which intrudes sedimentary rocks.
Waratah Bay in S Gippsland.	Small amounts of osmiridium occur in beach sands.
Quartz Crystal	
Bendigo gold field, 96 m. N of Melbourne on Calder Hwy.; Wattle Gully near Chewton; Fryerston; Tarnagulla; Maldon, 84 m. NW from Melbourne.	Found as a by-product of gold mining.
Melville Caves, near Rheola, 33 m. N from Maryborough.	Crystals in a large quartz-felspar pipe.
Tallangalook, 16 m. NW of Mansfield.	Crystals up to 300 lbs. in weight mined from a series of pipes in granite.
Silver	
Vic. gold fields.	Silver was won as a by-product during refining of gold from most of the Vic. gold fields. Most of Vic.'s production of silver came from this source.
Bethanga, 12 m. E of Albury.	Silver occurs in complex sulphide ores.
Omeo and Cassilis districts, E Gippsland, approx. 258 m. NE of Melbourne.	Silver occurs in complex sulphide ores.
Buchan district, 58 m. NE of Bairnsdale; Mt Deddick; Murrindal; Gelantipy.	Small lodes of argentiferous galena occur.
Heathcote area.	Silver lodes have been reported.
St Arnaud, 144 m. from Melbourne.	A rich gold and silver lode was worked in this area in the 1860s.
Pine Mountain near Walwa which is 15 m. N of Corryong.	Argentiferous galena occurs in association with fluorspar.
Tin	
chief ore mineral of tin is cassiterite.	
Beechworth-Eldorado, approx. 40 m. SW of Albury.	Alluvial tin occurs in the Woolshed Ck. Primary tin does occur in the Pilot Ra. near Beechworth.
Chiltern and Rutherglen, 17 and 26 m. W of Albury.	Small amounts of tin have been recovered from alluvial deposits.
Mt Walwa, 15 m. N of Corryong.	Low grade cassiterite ore occurs in pegmatite.
Eskdale and Tallandoon, 20 m. S of Tallangatta.	Tin has been reported.

VICTORIA

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Tungsten	
Mt Murphy 36 m. NE of Benambra.	Wolfram is found in quartz veins up to 4 ft. thick in slate and metamorphosed sandstone near the edge of a granite body.
Thologolong (Womabi Mine) 35 m. E of Albury.	Ore shoots are quartz reefs in granite.
Small quantities of wolfram have been produced from the following Vic. localities:	
Barnawatha, 13 m. W of Albury; Ensay, 27 m. S of Omeo; Fainting Ra., 6 m. SE of Ensay Sth.; Koetong, 14 m. E of Tallangatta; Linton 18 m. SW of Ballarat; Mt Bendoc, 30 m. SW of Bombala NSW.	In quartz veins.
Nine Mile Creek, Wedderburn, approx. 150 m. NW of Melbourne.	In quartz veins.
Warburton, 40 m. E of Melbourne.	In quartz veins.

NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Asbestos	
Baryulgie 52 m. NW of Grafton.	Chrysolite deposits occur in serpentine, consisting of zones several feet wide.
Near Wood's Reef, 12 m. E. of Barraba.	Chrysolite forms cross-fibre veins in serpentine derived from peridotite.
Byng, 10 m. SE of Orange. Lewis Ponds, 9 m. NE of Orange. Jones Ck., 3 m. NW of Gundagai.	Poor quality actinolite asbestos occurs in serpentine.
Rockley, 18 m. S of Bathurst.	
Barite	
Kempfield, 5 m. W of Trunkey, and approx. 30 m. SSW of Bathurst.	Occurs in lenticular masses in schistose rocks, about 1 m. from a granite mass. The outcrop extends for 270 ft. and a maximum width of 70 ft. and was estimated to contain 1,120 tons per vertical foot of surface. Galena is present on the eastern side of the deposit and pyrite and limonite are sparcely distributed.
Sugarloaf Hill, 1½ m. S of the Kempfield deposits.	Found in nodules and lenses on Sugarloaf Hill.
Gurrunda, 20 m. WNW of Goulburn. Lue, 15 m. by rail ESE of Mudgee.	The largest lens has a maximum width of 5 ft. at a depth of 12 ft. below surface.
A deposit 6 m. W of Braidwood.	Occurs in quartz schist and quartz porphyry. Much of the barite is iron-stained and patches of galena and sphalerite are common.
Mandurama, 30 m. by rail NE of Cowra. Cliefden Springs is the most important deposit.	It occurs in lens in Silurian andesite. Galena is present in places, but elsewhere the barite is of high grade.
Beryl	
Triple Chance Mine and Lady Beryl Mine, Egebek area, 28 m. by road SW of Broken Hill.	Crystals of beryl, some massive in pegmatites.
Thompson's Tank, 26 m. NNE of Broken Hill.	Crystals of beryl associated with pegmatite.
Skillbacks, 8 m. NW of Broken Hill.	In spoils heaps from felspar quarries.
Bismuth	
Whipstick Mines, 14 m. W of Pambula on the sth coast. Considerable quantities of bismuth at Torrington, Kingsgate, Deepwater and Tenterfield, while smaller amounts have been mined from Mt Bindo (Duckmaloi R.), Nanima, Emmaville and Holbrook (Wymah). The slopes of Mt Whipstick, 15 m. from Pambula and 36 m. from Bombala.	The important deposits are found in quartz pipes developed in siliceous granites near the junction with basic granite or sedimentary rocks. Bismuth is associated with deposits containing tungsten, molybdenum and tin. In earlier days a considerable quantity of bismuth was lost due to inferior treatment methods but now old dumps are re-treated profitably.
Chromite	
Deposits occur at intervals over the 50 m. from Wallendbeen, 10 m. NE of Cootamundra, to Tumut.	Deposits consist of numerous small lenses, some of which contain only a few tons of ore.
Bingara, 35 m. W of Inverell and Nundle Belt 28 m. SSE of Tamworth. Fineflower, 40 m. NW of Grafton.	The chromite bodies form irregular lenses.
Cobalt	
chief ore minerals of cobalt are smaltite, cobaltite, erythrite and asbolite.	
Broken Hill silver-lead-zinc deposits.	Cobalt has been extracted from the silver-lead-zinc concentrates at Broken Hill.
Port Macquarie, on the NE coast of NSW.	Consists of pockets of asbolite in decomposed serpentine as overlying ferruginous 'earth'.
Carcoar, near Blayney in the Central Highlands.	Lenses of cobalt occur in fissures in interbedded sedimentary and volcanic rocks near intrusive dyke. Cobaltite is associated with molybdenite and uranium minerals in quartz, felspar, chlorite, amphiboles and serpentine.
Bungonia, 10 m. S of Marulan.	Cobalt minerals occur in nodules in gravels.
Bismuth mine at Torrington, 15 m. NE from Emmaville.	Smaltite occurs in the tungsten-bismuth deposits.

NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Corundum	
Sapphire:	
Sapphire Fields Inverell district, 14 m. ENE of Inverell.	In soil and recent alluvium.
Diamonds	
Copeton on Copes Ck., 14 m. S of Inverell and many other localities in the same general area.	Deposits found in recent alluvials denuded from deep leads. These leads are buried under tertiary basalts.
Bingara: The Bingara diamond field is 6 m. WSW of Bingara township.	Water worn gravels resting on shale and associated claystone, sandstone, and conglomerate capping the foothills of a high basalt covered range. The alluvium has a maximum thickness of some sixty ft. The gem gravel portion ranges from a few inches to nine inches in thickness.
Cudgegong R.: Diamonds were found on the Gulgong goldfield near the Cudgegong R. abt 19 m. W of Mudgee.	In basalt covered leads 5½ m. W of Gulgong close to the junction of Wyaldra Ck. with the Cudgegong R.
Macquarie R., 10 m. SE of Wellington.	Recovered during gold dredging operations on the river by 'Wellington Alluvials'. The dredge was located near Sutton's Bar.
Mittagong: Diamonds were reported to occur about 7 m. SE of Mittagong on a creek flowing into the Nepean R.	Tertiary drift overlying a supposed pipe of volcanic breccia.
Crookwell: Potten Ck. and Spring Ck., 10 m. WNW of Crookwell.	Recent alluvials denuded from deep leads.
There are numerous other reported finds of diamonds in NSW, but little information is available to back up these reports.	
Garnet	
Broken Hill area.	Common in pre-cambrian gneiss and schist around Broken Hill.
Thackaringa-Egebeck area, 20 m. W of Broken Hill.	Outcrops of staurolite-garnet-biotite schist containing large crystals of almandite garnet.
New England District: Tingha-Copeton area.	Several deposits are recorded of micaceous schist containing numerous small red garnets. Also in alluvial gravels.
Pambula district, south coast.	In pegmatite pipes at the Whipstick Mine.
Gold	**Alluvial Deposits**
Gold is widely distributed throughout the State. In the eastern half, it ranges from the Queensland to the Victorian border, and the large blank, western area indicates where the sub-horizontal and non-auriferous Mesozoic, Tertiary and post-Tertiary deposits conceal the older folded and gold-bearing rocks.	Some gold has been won from beach-sands on the far North Coast, but apart from this the secondary deposits are almost wholly alluvial.
Of host-rocks the most common are the Silurian and Ordovician strata, especially those of the Central and Southern Highlands and their western slopes, which form the biggest gold-region.	Two secondary deposits of pre-Tertiary age may be noted. The Tallawang district near Gulgong has yielded gold at a rate of up to 15 dwt. to the ton, including a number of small nuggets. In the far north-west conglomerates have proved auriferous at Tibooburra and Milparinka, and here, as at Tallawang, the deposits are possibly lacustrine rather than strictly alluvial.
	Alluvial gold from Tertiary and post-Tertiary deposits has been at least as important as that won from reefs. The deposits comprise both shallow and deep leads; the former in general composed of the Recent alluvium of the rivers which is still being added to; the latter composed of deposits from rivers no longer existing. These may be covered by alluvium or basalt or both, and they may be contained within the walls of a present-day broad river-valley either at a lower level than the present stream or else, especially the basalt-covered leads, well above it. Other basalt-capped leads may form the walls of existing river-valleys or may be entirely independent of the present drainage-system.

NEW SOUTH WALES

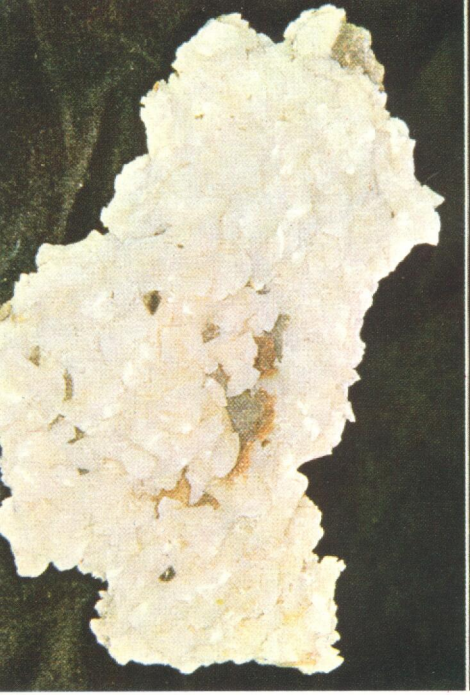
MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	The attitude of the lead to the existing topography has an important bearing on the availability of its metallic content, and on mining practice. Many nuggests were found in the alluvial deposits. The largest, from Burrandong near Orange, weighed 1286 oz. Several smaller nuggets, ranging from 170 oz. downwards, were reported from Gulong, Forbes–Parkes, Kiandra and other fields. The west-flowing streams have had most attention, because of their longer alluviated stretches. Many of the New England streams have proved auriferous, but those of the Central and Southern Highlands have produced most of the gold, including the Macquarie, Lachlan, Murrumbidgee and Murray Rivers and their innumerable tributaries on the plateau.
Forbes–Parkes District.	Alluvium-covered deep leads—sometimes exceeding 400 ft. in depth. Surrounding flats so wide that exact course of old gutters difficult to trace. Gradients of some of old channels were as much as 100 ft. to the mile and the basal alluvial material often very coarse. Payable length of the leads limited. Difficulties were encountered in mining because of water-bearing sands above the auriferous wash, and it is certain that much gold was left behind. Records show that in 1862, 235,043 oz. of gold were won at Forbes in less than 12 months.
The Shoalhaven River about Braidwood—for about 20 m. downstream. River flows through an alluvial plain up to 4 m. wide.	In places river entrenched in this plain, but elsewhere cuts a channel through the bedrock granite quite outside its old bed. Alluvium, consisting of alternating beds of gravel, sand and clay, is more than 150 ft. deep. Auriferous especially near the base. Occasionally on a false bottom of cemented alluvium yields of gold greater than on true bedrock.
Young.	Tertiary auriferous drifts dissected and contents redistributed in post-Tertiary stream-beds. Gold derived ultimately from hornblende-granite yields from a few pennyweights up to 1½ oz. to the load and nuggest up to 8 oz. This field once supported population of 20,000.
Basalt-covered leads, Central Highlands—at Lucknow and Forest Reefs near Orange, Bald Hill, Rockley and Trunkey.	Particularly good examples of leads revealed by the entrenching of twin streams, formed on either side of a lead. In Trunkey district Rocky Bridge Ck. flows for nearly 2 m. on the basalt covering of a lead. Downstream as result of rejuvenation, creek gradient steepens, so that lead eventually 300 ft. above stream-level.
The Brothers Lead near Newbridge.	Remnant of an old basalt-covered river-bed now some 200 ft. above the general level of the surrounding surface. Bald Hill and Stuart Town heads situated within walls of Macquarie R. valley, 500 to 800 ft. above stream-level.
Gulong—on headwaters of Cudgegong River.	Basalt and lead entirely below the floor of the present broad, alluviated valley-plain. Basalt up to 160 ft. thick, overlying clay, sand and gravel up to 60 ft. thick, and the lead up to 500 ft. wide and from 1 to 60 ft. thick. Bedrock is part Silurian limestone hollowed into large caverns and later filled with auriferous wash. Several leads worked, but gold values diminished downstream. One lead contained diamonds. Yields of gold varied from a few pennyweights

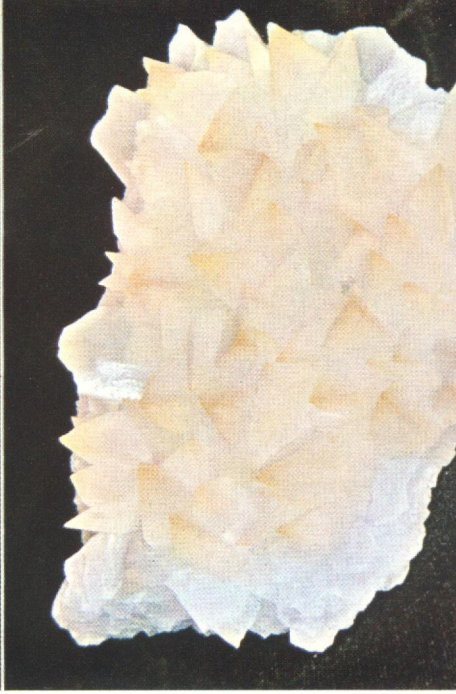
NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	to 13 oz. a load. From 1870 to 1874, 399,678 oz. were won.
Kiandra, at head of the Eucumbene R. Lead traced more than 20 m. with average gradient N of 39 ft. to the mile.	Alluvium 150 ft. thick and basalt up to 200 ft. thick. Channel of the old stream rarely exceeds 10 chains in width, with 50 yds. of auriferous wash up to 25 ft. thick composed of sand and gravel. Remainder of alluvium consists of clay and sand with occasional thick beds of lignite and lignitic clay containing plant-remains.
Grenfell. Auriferous alluvium often exceeds 300 ft. in Murray valley around Corowa and Albury.	Basalt-covered leads widely distributed at elevations ranging from more than 5000–1500 ft.
Uralla. 15 m. SE of Armidale.	Kiandra–Gulgong. Relation of leads to present topography exceedingly varied. Surface composed mostly of basalt up to 160 ft. thick. Underlaid by sand, clay and gravel from 5–40 chains wide, and from 2–114 ft. thick. Some of sands immediately underlying the basalt converted into quartzite (billy). The leads, extending perhaps a couple of miles, have been partly dissected by Rocky R. Thickness and extent of carbonaceous clays suggests that leads are partly lacustrine. Gold was locally very abundant, with one of the outlying leads some 25 chains long producing 10,000 oz. Yields now generally much less.
Basalt-covered leads. West of New England, at Hanging Rock, near Nundle, Bingara Range near Bingara and Nandewar Range.	
Graphite	
Undercliffe Mountain, 15 m. ESE of Stanthorpe.	Deposits consist of beds of amorphous graphite, which have been altered from carbonaceous shales and coal seams, interbedded with highly-folded shales and tuffs.
Winterbourne Station, about 30 m. SE of Armidale.	Very fine grained graphite occurs in a dyke which outcrops for 900 ft. and ranges in width from 6 to 30 ft. The graphite kernels range from ½ to 1 in. in diameter.
Drake, Tenterfield, and Dundee, in N New England district.	Deposits of graphite are known.
Grafton; Mudgee; the headwaters of the Abercrombie R., N of Goulburn; the Cordeaux R., W of Wollongong; Wagga Wagga; Eden and Pambula on the far S coast.	
Gypsum	
Either side of the Broken Hill line between Trida and Menindee, 466 and 625 m. by rail WNW of Sydney	The deposits range from half an acre to over 2000 acres in area, with a thickness of a few inches to more than 20 ft. of gypsum.
Gypsum Palace, 27 m. NW of Ivanhoe.	An extensive gypsum bearing depression of approx. 1200 acres occurs at Gypsum Palace, in dune ridges which cover the surface to heights of 3 ft. and is underlain by gypsum crystals.
7 m. N of Manara rlwy siding, 50 m. W of Ivanhoe.	A gypsum deposit covers an area of over 500 acres. The gypsum occurs as crystals in blue-grey clay. The crystals, which range from less than ¼ in. to over 2 in. in length, occur to a depth of 10 ft. below the surface.
Marlow homestead, 14 m. N of Conoble.	Gypsum is located in a depression some 600 acres in extent.
Gol Gol, 18 m. E of Wentworth.	An extensive deposit of gypsum occurs about 4½ m. NE of Gol Gol, in a depression, over 5000 acres in extent.
Nulla Nulla, 17 m. N of Lake Victoria (near Wentworth).	Estimated to contain more than 50,000,000 tons of gypsum.

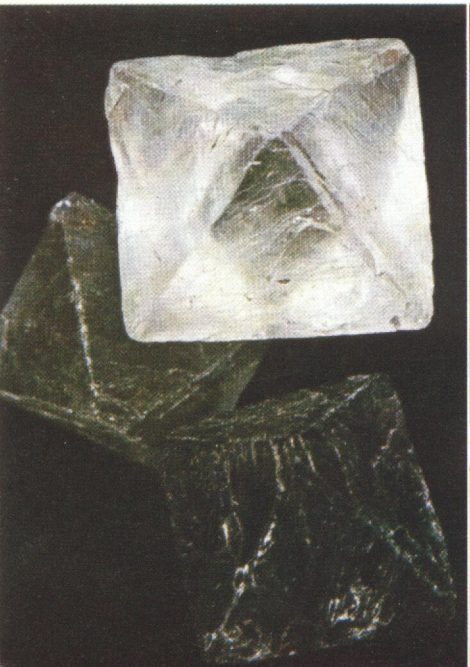
▲ Garnet in Chaucopyrite

▼ Selenite



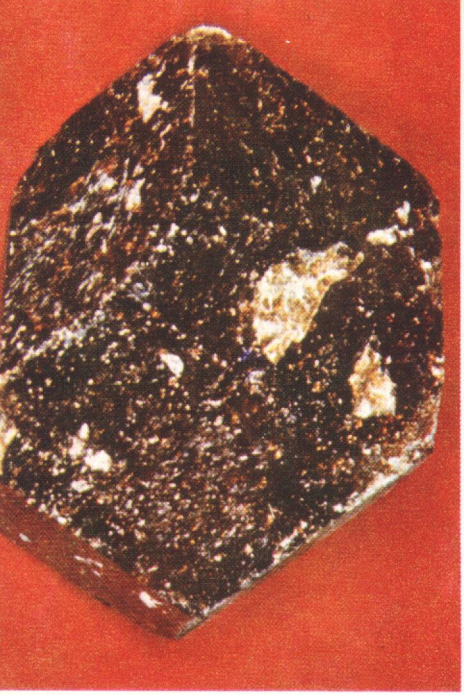


▲ Dolomite ▼ Flourite Crystals ▲ Calcite ▼ Galena

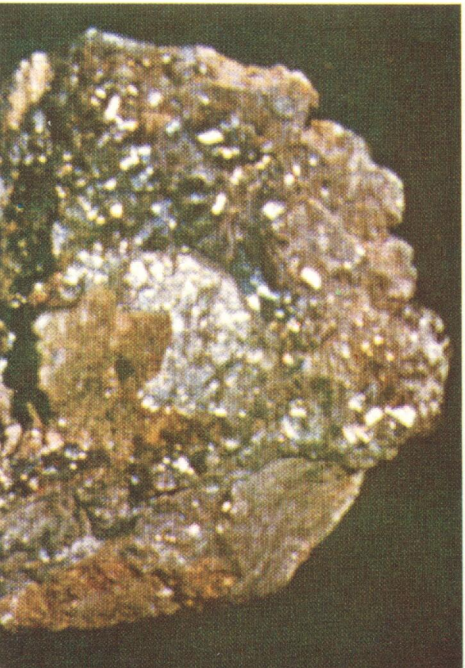


▲ Quartz

▼ Native Sulphur



▲ Dravite ▼ Chalcopyrite ▲ Aragonite ▼ Campylite



NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Lake Wyangan, 4 m. NW of Griffith.	The main deposit consists of translucent crystals in grey clay.
White Plain, 7½ m. N of Balranald; Bidura, 40 m. N of Balranald.	
Paka, 19 m. W of Bourke.	Gypsum occurs over an area of about 270 acres. The deposit is up to 13 ft. in thickness.
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Tweed Heads to Clarence R.	Heavy mineral deposits occur on or behind most of the beaches on this stretch of coast line. The deposits are found in the same form as on the Queensland beaches between Tweed Heads and Fraser I. (*see* Queensland Beach Sands). Most seams are from 2 to 5 ft. thick.
Cudgen Beach 10 m. S of Queensland border.	It is estimated that economic deposits containing a quarter of a million tons of rutile exist on the Tweed Heads Byron Bay section of coast.
Tallow Beach S of Cape Byron.	Heavy mineral sand deposits have been mined as far south as Shellharbour 10 m. S of Wollongong. Further deposits are known to occur along the coast to the Vic. border but south of Shoalhaven R. deposits are small because the source rocks are not present inland, and the coastline does not have long, gently sloping beaches.
Lead and Zinc	
Broken Hill (lead-zinc-silver).	One of the world's most important producers of lead and zinc, galena and sphalerite. The deposits are massive lodes, with secondary mineralization and oxidation, contained in layers in steeply dipping garnet-biotite-sillimanite gneisses and amphibolite enclosed between granite gneiss. Associated minerals are bustamite, calcite, quartz, garnet, feldspar, rhodonite and fluorite—in the lead lode; and pyrrhotite, chalcopyrite, quartz, feldspar, garnet rhodonite and hedenbergite in the zinc lode.
Broken Hill district: numerous other deposits have been worked in the area—	
The Pinnacles—10 m. SW of Broken Hill (silver-lead-zinc).	
The Thackaringa mines—20 m. WSW of Broken Hill (silver-lead-zinc); Umberumberka Mine near Silverton, 16 m. WNW of Broken Hill (silver-lead-zinc).	Vein fillings.
Captains Flat, 35 m. SE of Canberra (silver-lead-zinc).	Steeply plunging lenticular overbodies, 2400 ft. long, averaging 15 ft. width and worked to depth of 2030 ft. The ore occurs in thin bands of shale near the top of dacite flows.
Yerranderie Field, 60 m. SW of Sydney (silver-lead-zinc).	Lodes consisting of lenticular shoots from 3 to more than 100 ft. long up to 5 ft. wide and worked to depth of 1448 ft.
Production of lead is recorded at: Conrad and King Conrad mines near Howell, 13 m. SSW of Inverell	Complex sulphide lodes in porphyry filling shears in granite.
Cobar (silver-lead-copper-gold).	Massive sulphides in slaty claystone.
Kangiara, 20 m. NW of Yass (silver-lead-zinc-copper).	Narrow silver-lead-zinc-copper-gold lodes in quartz porphyry.
Mineral Hill, 42 m. N of Condobolin (lead).	Irregular lodes in silicified slate and sandstone near felsite intrusion.
Mt Stewart; Leadville, 40 m. N of Mudgee (lead).	Lodes in quartz-feldspar porphyry dykes.

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Minor quantities of lead have been produced from: Bobadah, 60 m. NNW of Condobolin; Boorook, 20 m. NE of Tenterfield; Boro Ck., 10 m. SSE of Tarago; Buddigower, 12 m. SW of Wyalong; Bungonia, 15 m. E of Goulburn; Carboona, 20 m. SW of Tumbarumba; Condobolin (Sunny-Corner), 17 m. WNW of Lithgow; Costigan mine near Tuena, 40 m. S of Bathurst; Drake, 24 m. ENE of Tenterfield; Halls Peak, 25 m. S of Hillgrove; Kootra Mine, 6 m. NNW of Cootamundra; Lewis Ponds, 10 m. NE of Orange; Milton, 35 m. S of Nowra; Moruya on the south coast; Mt Gabua, 9 m. SW of Emmaville; Mt Shorter, 5 m NE of Orange; Narraburra, 10 m. NE of Temora; Pyes Ck., 10 m. NE of Torrington; Rivertree, 35 m. NNE of Tenterfield; Rosedale, 7 m. NE of Orange; Spion Kop, 15 m. NW of Yass; Walla Walla, 20 m. N of Yass; Webb's consols mines near Emmaville, 20 m. NW of Glen Innes; Woolgarlo, 17 m. SW of Yass. Of the above locations zinc ore is recorded at: Bobadah, Condobolin, Drake and Kootra.	
Magnesite	
Attunga district, 7 m. NE from Attunga rlwy station.	The deposits occur as irregular veins and pockets in serpentine. The magnesite veins vary in width from a few inches to several feet and in places the system of these is an extensive network. A series of small magnesite outcrops occur for some distance along the west margin of the serpentine which has a general northwest strike. Some of the magnesite is hard and white and part is powdery.
Fifield, 14 m. SW of Tullamore.	Here it occurs in nodular forms as pockets in red and green coloured rock. The nodules range from a few ounces to over a 100 pounds. The outcrops are small and scattered, the magnesite being under a cover of soil 2 ft. to 9 ft. thick. Generally, the magnesite in this area is hard, compact and in fine grained massive form.
A deposit occurs 1½ m. NE of Cobar.	An impure deposit occurring as irregular veins along the bedding planes of clay shales.
Dripstone, 6 m. E of Wellington.	There is a limited exposure.
Gobondery, 22 m. SSE of Tullamore.	Deposits occur as nodules and veins in yellowish rock.
Piedmont; Tottenham; Warialda; Mt George.	These are less extensive deposits.
Manganese	
Hungerford and Spencer's mine, 15 m. NE of Barraba; O'Neill's Black and White mine at Danglemah, E of Tamworth; Rockley, 20 m. S of Bathurst; Rylstone, 30 m. SE of Mudgee; Glanmire, 8 m. E of Bathurst.	
Manganiferous material occurs in numerous places from Parkes south to Gundagai. Important mines in the belt are: Deposit 2½ m. W of Grenfell; Simpson's deposit, 3 m. N of Hoskins Mine; Cookamidgera, 10 m. SE of Parkes; Murwillumbah on the far W coast; Deepwater, 22 m. N of Glen Innes; Nundle, 30 m. SE of Tamworth; Kempsey, Port Macquarie, Wauchope and Taree on the N coast; Gulgong; Dubbo; Fifield, 14 m. SSW of Tullamore; Cooma and Michelago, 37 m. N of Cooma.	The manganese occurs for approximately 125 m. along the western edge of a granite batholith.

NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Mercury—*chief ore mineral of mercury is Cinnabar.*	
Yulgilbar deposits are 45 m. NNW of Grafton.	Several lodes of cinnabar occur in hornblende granite along the contacts with intrusive diorite dykes. The cinnabar occurs as minute veins throughout the replaced rock, which has maximum thickness of 12 ft.
Pulganbar deposits are situated on the W side of Pulganbar Ck., 34 m. NW of Grafton.	Rocks in the area consist of altered sedimentary rocks intruded by granodiorite and tourmaline granite. The principal cinnabar deposit is the Federal Lode, which occurs in the granodiorite and consists of chalcopyrite, pyrite, cinnabar and calcite, in hard quartz-like rock.
Lionsville, 45 m. NW of Grafton.	Cinnabar occurs in narrow quartz veins in granite.
Cudgegong, 5 m. W of Rylstone.	Occurs as sharp angular pieces in the alluvium of the Cudgegong R.
Mica	
Egebek, 28 m. SW of Broken Hill.	Small amounts of mica occur in association with feldspar and beryl in coarse pegmatite dykes.
Euriowie, 42 m. NE of Broken Hill; 1 m. E of Broken Hill	Mica has been reported.
Bombala, SE NSW.	
Molybdenite	
Kingsgate, 20 m. E of Glen Innes.	Molybdenite is associated with bismuth in quartz pipes in granite.
Deepwater, 21 m. N of Glen Innes.	A deposit occurs 2 m. E of Deepwater. The molybdenite occurs with bismuth in quartz and pegmatite pipes near the margin of a coarse granite.
Rocky R., 26 m. SE of Tenterfield; Glen Eden, 12 m. N of Glen Innes; Mt Booroolong, 28 m. NNW of Armidale; Hillgrove, 18 m. E of Armidale; Moonbi, 9 m. NE of Tamworth.	
Whipstick Mine area Wyndham, 16 m. NW of Eden.	In association with bismuth minerals in irregular pipes near the top of a granite stock.
Mt Tennyson, 13 m. E of Bathurst. Other deposits occur nearby: 2 m. N of Gemalla rlwy stn; 3 m. N of Tarana rlwy stn.	The molybdenite is scattered through a zone of garnet rock between granite and metamorphosed sediments.
Warrell Ck., 6 m. S of Macksville.	Small deposits of molybdenite occur.
Deposit 4 m. SE of Holbrook.	Small deposits of molybdenite occur.
Wog Mountain, 22 m. SE of Bombala.	Small deposits of molybdenite occur.
Nickel	
Broken Hill.	The lode contains rare grains of nickel.
Port Macquarie.	Nickeliferous cobalt-bearing ores have been worked for cobalt.
Platinum	
Fifield, 19 m. W of Trundle rlwy stn., 315 m. W of Sydney.	The area consists of slate, sandstone and limestone, intruded by dykes. The Platina Lead (an ancient river system) traverses the country. The lead contains wash bearing gold and platinum. The wash extends from 60 ft. to 150 ft. in width and ranges from 60 ft to 70 ft. below the surface. The platinum and gold occur as coarse grains and are concentrated in depressions in the bed rock and a few inches at the base of the wash.
Gillenbine Tank, 2 m. SE of Fifield.	Platinum bearing wash ranges from 40 ft. to 60 ft. in width and is overlain by 80 ft. to 90 ft. of overburden.
Jack's Lookout, a low hill 2 m. E of Fifield.	Occur as grains in water-worn conglomerate.
Macquarie R. near Wellington.	Small quantity of platinum was recovered as a by-product of gold dredging.
Quartz Crystals	
Throughout New England district.	In quartz-molybdenite-bismuth pipes.
Kinsgate Field.	In quartz-molybdenite-bismuth pipes.

NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Northern New England: Deepwater; Elsmore; Sandy Hill.	In quartz-molybdenite-bismuth pipes.
Kookabookra, 27 m. SE of Glen Innes.	Quartz crystal found in alluvial gravels.
Silver	
Broken Hill.	The Broken Hill lode has been the most important single source of silver in Australia. In the oxidised zone it occurred as native silver and the halides embolite, iodyrite and cerargyrite. In the secondary sulphide zone as the sulphides argentite, jalpaite and stromeyerite. In the primary zone the main sources of silver are galena, sphalerite and tetrahedrite, dyscrasite and pyrargyrite.
Broken Hill district: Apollyon Valley; Purnamoota; Silverton; Thackaringa.	Silver recovered from oxidised zones.
Yerranderie in the Burragorang Valley, 60 m. SW of Sydney.	Silver-lead ore mined. The silver is found in argentiferous galena, pyrargyrite native silver and electrum.
Cobar, W NSW.	As a by-product of copper and lead.
Captains Flat, 35 m. SE of Canberra.	As part of the lead, zinc and copper concentrates produced at Captains Flat, the principal silver ore being arsenical tetrahedrite.
Leadville, 40 m. N of Mudgee.	Lodes of silver-lead ore in slate and limestone.
Sunny Corner, 17 m. WNW of Lithgow.	Small irregular bodies of silver-lead ore near the contact of felsite and slate.
Howell, 13 m. SSW of Inverell.	Some recovery of silver is noted from the Conrad and King Conrad Mines which were worked for silver, lead, copper, tin and arsenic.
Mineral Hill, 42 m. N of Condobolin.	Small irregular auriferous silver-lead bodies in slate and sandstone intruded by felsite dykes.
Boorook Mines, 20 m. NE of Tenterfield.	Lodes in claystone and tuff. Silver sulphides associated with galena, gold, pyrite and sphalerite.
Kangiara Mine, 20 m. NW of Yass.	Ore bodies in quartz porphyry consisting of a complex mixture of chalcopyrite, galena and sphalerite with silver and gold.
Other N.S.W. localities which have produced silver are: Back Ck., 6 m. N of Rockley; Cordillera, 50 m. S of Bathurst; Costigan, 43 m. S of Bathurst; Hillgrove, 15 m. E of Armidale; Lewis Ponds, 10 m. NE of Orange; Moruya, 150 m. S of Sydney; Overflow Mine near Bobadah; Potters Mine at Condobolin; Rivertree, 35 m. NNE of Tenterfield; Walla Walla at Rye Park, 20 m. N of Yass; Webb's Silver Mine, 11 m. S of Emmaville.	
Silver has been reported from the following N.S.W. districts: Armidale (Rockvale, Tait's Gully, Tulloch Mine); Bathurst (White Rock); Captain's Flat (Bendethara); Cobar (Billagoe); Cooma (Bredbo, Buckley's Crossing, Dartmore); Cootamundra (Bauloora); Crookwell (Nymagee, Peelwood); Dungog (Upper Chichester); Emmaville (Little Plant Ck., Mt Galena, Pyes Ck., Reedy, Ti Tree and Wellingrove); Inverell (Ellsmore, Greengate, Swanbrook and The Brothers); Lake George (Boro Ck.); Nambucca Heads (Newee Ck. and Warrell Ck.); Pambula (Whipstick Mine); Tenterfield (Boonoo Boonoo); Tumbarumba (Carboona and Bombala); Walcha (Halls Ck.); Yass (Spion Kop).	
Talc	
Wallendbeen, 10 m. NE of Cootamundra.	Deposits occur in a belt of altered sedimentary stone. The beds strike N 10° W and dip steeply to the E. Some of the deepest shafts reach 42 ft.

NEW SOUTH WALES

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Cow Flat, 10 m. SW of Bathurst.	Talc occurs in lenses associated with magnesite and dolomite. Traced in SW direction the talc gives place to a dark-green talc-schist in bedded with a hardened limestone.
Tin	
chief ore mineral of tin is cassiterite.	
New England area: Emmaville; Wilson's Downfall; Tenterfield; Deepwater; Torrington; Stannum and Bald Knob; Tingha and Elsmore.	The largest amount of tin has been mined from alluvial stream deposits and terraces. Cassiterite does occur in lodes in the granite of the area.
Inverell and Glen Innes: Main centres were Ottery mine, 15 m. W of Deepwater; Conrad Lodes at Howell, about 18 m. S of Inverell.	Lodes of tin were worked.
Bendemeer in S New England area and along Watson's Ck., 14 m. NW of Bendemeer.	Lodes of tin were worked.
Ardlethan, 343 m. W from Sydney.	Tin deposits occur in a zone about 12 m. along the eastern margin of granite which intrudes sedimentary rocks.
Tungsten	
New England district: Hillgrove, 22 m. E of Armidale.	Minerals scheelite, antimony, gold in a quartz gangue. Rocks are shale, sandstone, and greywacke, which are metamorphosed to schist, quartzite and slate.
Torrington, 17 m. NW of Deepwater.	Blows, dykes and sills of quartzose rocks rich in fluorite and topaz carrying wolfram and bismuth. Wolfram also occurs in quartz chlorite veins in granite; these are worked mainly for tin.
Other localities in the New England district from which small amounts of Wolfram have been mined: Deepwater, N of Glen Innes; Glen Eden, NE of Glen Innes; Inverell district; Rocky R. (Tenterfield district); The Gulf (Emmaville district); Wilson's Downfall (Tenterfield district).	
Frogmore Mine, 2 m. NE of Frogmore; 15 m. NNE of Boorowa.	Wolfram—scheelite in quartz veins in slate, sandstone, and crushed porphyry. In quartz veins displaced by faults associated with bismuth.
Small quantities of Wolfram have been produced from the following N.S.W. localities: Ardlethan, 40 m. NE of Narrandera; Black Andrew Mine, 3 m. SSW of Burrinjuck Dam; Burrandana—Pulletop, 20 m. S of Wagga Wagga; Canbalego district; Cooma district; Delagete district; Marks Hill (Boorowa district); Mt Tallebung, 46 m. NW of Condobolin; Rye Park, 12 m. ESE of Boorowa; Thompsons Tank, 26 m. NNE of Broken Hill.	
Wagga Wagga district; Wild Cattle Ck., 16 m. N of Dorrigo; Wymah, 25 m. E of Albury.	Small scheelite and scheelite-wolfram deposits in sericite schist.
Yalgogrin, 60 m. S of Condobolin.	Wolfram in quartz veins associated with molybdenite.
Small quantities of scheelite have been produced from: Barraba; Hanging Rock, nr Nundle; Kootingal, 10 m. NE of Tamworth; Tuena, 32 m. N of Crookwell Yetholme.	Scheelite, molybdenite and powellite disseminated through a garnet rock.

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Antimony	
Northcote field, 15 m. W of Mareeba.	The antimony and gold tend to occur in steeply dipping auriferous quartz reefs. The stibnite and gold tend to occur in separate shoots, and the antimony-gold ratio in the reefs ranges widely.
Woodville area (near Mt Mulligan, 35 m. WNW of Mareeba).	These are similar to those of Northcote—most of the lodes were worked primarily for gold.
30 m. NW of Mt Mulligan, near the Mitchell R.	Several lenticular quartz outcrops containing antimony and gold have been worked.
Gympie area, 90 m. N of Brisbane—Neardie Mine, 12 m. N of Gympie.	The ore occurred as shoots along a well-defined, steeply-dipping fissure in phyllite and sandstone.
Asbestos	
No commercial deposits discovered in Qld. Reported at Dayboro, 30 m. N of Brisbane; Kandanga, 20 m. S of Gympie; N Rockhampton; Mt Pring, near Bowen.	In serpentine belt.
Barite	
Gympie district—Calico Ck.	Irregular veins and masses.
Sth Amamoor, Miva and Cutlog Ck.	In lodes.
Kinbombi, 8 m. SW of Kilkivan.	
½ m. S of Einasleigh. Mt Chalmers gold and copper mine, 12 m. NE of Rockhampton.	
Near Running Ck., 35 m. WSW of Maryborough.	
Bauxite	
Cape York Peninsula—Weipa.	Economic-grade bauxite occurs over an area of 200 sq. mls. and constitutes one of the largest single areas of bauxite in the world. It occurs as a flat-lying to gently-dipping laterite ranging in thickness from a few feet to 30 ft., overlying sand clay and silt.
Tamborine Mountain, 35 m. SSE of Brisbane.	Nodular and earthy bauxite underlies ferruginous laterite, the whole forming a cover over massive basalts of the area.
Hampton, 14 m. N of Toowomba.	A deposit of nodular bauxite occurs in the crest of the Dividing Range.
Beryl	
Mica Ck.–Galah Ck. area, SSW of Mt Isa.	In pegmatite deposits.
Bismuth	
Biggenden Mine, 4 m. W of Biggenden on the Maryborough–Gayndah rlwy.	The deposits occur along a zone of fissuring in slate adjoining a bed of limestone, near the edge of a granite mass. Bismuth occurs with a little gold in massive magnetite-calcite bodies up to 50 ft. wide.
Mt Hastings, 1 m. S of Mt Biggenden and at the Commonwealth Copper Mine at Mt Havilah, 1 m. N of Mt Biggenden.	Both similar to the Biggenden Mine deposits.
Wolfram Camp, 15 m. NW of Dimbulah on the Cairns–Chillagoe rlwy line and Bamford Hill, 2 m. NNW of Petford on the same line.	Native bismuth is associated with wolfram and molybdenite in quartz pipes in granite.
Ukalunda Homestead, 80 m. SE of Charters Towers.	Small bodies of complex bismuth-gold-copper-silver sulphide ore occur in fissures in granite near the homestead.
Nolan's Ck., 25 m. NW of Mungara; Ollera Ck., 40 m. NW of Townsville; Percy R., 30 m. SE of Forsayth.	These are all small deposits.
Kangaroo Hills, 64 m. NW of Townsville.	
Marraba, 23 m. SSW of Cloncurry.	
Cobalt	
chief ore minerals of cobalt are smaltite, cobaltite and erythrite.	
Mt Cobalt mine, abt 18 m. S from Selwyn.	The ore occurs in lenses in a shear zone at the intrusive contact between wide dykes and mica schists and quartzites. The principal cobalt

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	mineral is cobaltite, with erythrite near the surface.
Success Mine, 17 m. SW of Cloncurry.	The lode occupies a shear zone. The mine was first worked for copper and then for cobalt ore, which occurs at depth. Cobaltite, the main mineral present, is associated with copper sulphides, pyrite and small quantities of nickel.
Queen Sally Mine, 6 m. SE of Kajabbi.	The deposits were worked for both primary ore, consisting of cobaltite and some gold in quartz, and oxidized ore consisting of asbolite, erythrite and oxidized copper minerals.
Chillagoe field NE Qld., cobalt ore was mined in the 1920s from the Cambourne copper lode.	Cobalt minerals have been reported.
Montalbion, 50 m. E in the Herberton district.	Cobalt minerals have been reported.
Ortona, 60 m. S of Forsayth.	
In SE Qld.—Black Snake Ck., 8 m. S of Kilkivan.	Cobaltiferous wad had occurred in shattered serpentine.
Copper	
Mt Isa and Cloncurry lie in the Precambrian mineral belt of NW Qld., approx. 500 m. W of Townsville.	
Mt Isa, 603 m. W of Townsville.	Outcrop of the silver-lead-zinc ore-bodies were discovered in 1923. The concealed copper ore-bodies were discovered by diamond drilling in 1930. The major copper ore bodies consist of chalcopyrite with pyrrhotite, pyrite and small amounts of galena and other minerals.
The Mt Elliott mine at Selwyn, 55 m. S of Cloncurry.	Was the largest individual producer of ore in the Cloncurry field before Mt Isa and has yielded the third largest tonnage of metallic copper. Since closure of the mine, several attempts have been made to trace extensions of the ore bodies.
The Trekelano Mine, 9 m. SE of Duchess, and abt 70 m. SW of Cloncurry.	The primary ore is essentially chalcopyrite in a calcite gangue.
Humpden Copper Mine near Kuridala abt 40 m. S of Cloncurry.	Several mines operated in the area between 1898 and 1921—began operations with ore containing 37 percent copper and worked until 1921 when the grade had fallen to 3·75 percent copper.
Mt Oxide copper mine 45 m. WNW of Dobbyn and about 90 m. N of Mt Isa.	At the surface the ore consists chiefly of malachite with lesser amounts of azurite and cuprite.
Etheridge goldfield—Einasleigh Copper Mine, 222 m. by rail SW of Cairns.	Native copper and copper carbonates occur near the surface. The mine was worked to a depth of about 600 ft., where 18,000 tons of developed ore is reported to average 6 per cent copper.
Hall's Reward Copper Mine, 70 m. SE of Einasleigh.	The mine has been worked continuously since 1937 for auriferous copper carbonate ore. The ore occurs in a shear amphibolite along its junction with comformably overlying schist, adjacent to a serpentine intrusion.
Ortona Copper Mine, abt 90 m. S of Forsayth.	Copper lodes fill fissures or contraction joints in diorite dykes and have a maximum width of 15 ft. and a length of 600 ft. The ore consists of quartz and hematite, with copper, silver and gold.
Chillagoe goldfield—O.K. mine group, 45 m. NNW of Mungara.	The principal deposit consists of a series of pipes of massive pyrite-chalcopyrite ore, carrying up to 18 percent copper, connected by a larger body of kaolinitic ore carrying up to 8 per cent copper.
Ruddygore mine, 3 m. NE of Chillagoe.	Copper associated with granodiorite.
Herberton goldfield—50 m. SW of Cairns.	The field is best known as a tin field, but also contains deposits of copper, silver-lead, gold

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	and wolfram. The copper lodes occur in Palaeozoic quartzite west of a granite contact near Herberton. The copper mines are aligned in a general belt tending NNE, and were formerly known as the 'copper firing line'.
Mareeba mineral field—Mt Molloy Copper Mine, 35 m. NW of Cairns.	The lode was noted for its high-grade secondary sulphides containing massive chalcocite.
Clermont goldfield in Central-eastern Qld.	At the surface the lode consists of silveous ironstone gossan carrying carbonates of copper, and has been traced with two breaks over a length of 1¼ m.
Mt Morgan, 23 m. SSW of Rockhampton.	The deposit discovered in 1882, was originally worked for gold, and copper mining did not begin until 1902 when the workings reached the copper bearing ore in the lower part of the deposit.
Glossford mineral field—Many Peaks mine in the Boyne Valley 48 m. S of Gladstone.	The ore consists of banded chalcopyrite and pyrite in masses ranging from an inch to several feet across.
Glossford Ck., situated 8 m. SW of Many Peaks.	Several replacement ore bodies occur in granular garnet-magnetite rock at the contact between granite and limestone, over a distance of 2 m.
Mt Cannindah mineral field abt 50 m. SSW of Gladstone.	The ore body occurs as small shoots in a breccia zone about 100 ft. wide in altered slate.
Tenningering goldfield, 50 m. WSW of Bundaberg.	The four main groups of copper lodes are at Mt Perry, Wolca, Harper's Hill and Boolboonda.
Corundum	
Anakie Sapphire Field, 180 m. W of Rockhampton.	In alluvium and old watercourses.
Gilbert R., Percy R., 4 m. SW of Percyville, 30 m. SSE of Forsayth.	In alluvial deposits.
Jordan Ck., 22 m. W of Innisfail.	In alluvial deposits.
Tully R., 42 m. S of Herberton.	In alluvial deposits.
Stanthorpe mineral field, 110 m. SW of Brisbane.	In alluvial deposits.
Diamonds	
Anakie, 25 m. W of Emerald on Capricorn Hwy.	In the sapphire drifts.
Gilberton, approx. 160 m. W of Townsville.	In gold drifts.
Stanthorpe, 91 m. S of Toowoomba.	In tin drifts.
Garnet	
Mary Kathleen, 49 m. WSW of Cloncurry.	Dark green fractured grains of andradite occur in metasomatically replaced calc-silicate rocks associated with the deposits or uranium.
South coast.	Garnets are common mainly of the almandite type in the beach sands of Sth Qld.
Gold	
At the Russell R. Goldfield, 30 m. S of Cairns.	Gold, associated with tinstone, is found in a gravelly wash beneath Cainozoic basalt at a height of 250 ft. above sea-level. The lead has been laid bare through dissection by existing streams and some of its gold content, concentrated in their beds. Basalt-capped leads have also been worked at Mt Rainbow in the Port Curtis district.
At the Clermont field, which covers an area of 300 sq. m.	The detrital gold is of four different ages. Resting unconformably on the old auriferous slates and phyllites which form bedrock are outliers of Upper Bowen coal-measures. At and near the base of these are two horizons of conglomerate and boulder-beds dipping at angles of from 5° to more than 25° and associated with shales containing *Glossopteris*. Both the conglomerates are auriferous. Some of the so-called leads are poorly defined, and the auriferous beds seem to have been lacustrine or

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	estuarine rather than fluviatile. Other leads, regarded as Tertiary, are practically covered with basalt directly overlying quartzite which is slightly auriferous. A post-Tertiary age is determined for certain leads which cut across these and which contain boulders of basalt and billy, or have yielded fossil bones of Pleistocene or early Recent age. Finally, alluvium of the existing creeks contains gold derived from all the older deposits. The sinking is mostly shallow and easy, and only in a few places has it exceeded 100 ft., maximum being 250 ft. in one of the Upper Bowen leads. The richness of the deposit varies from a few dwt. to as much as 20 oz. to the load.
The Palmer field.	Has yielded mostly alluvial gold. Old schists enclosing reefs are overlain by level-bedded Cretaceous conglomerate and sandstone, the former of which is richly auriferous though the payable gold is erratic in distribution. The gold-bearing area covers more than 2000 sq. m., and the gold occurs principally in stream-beds and shallow alluvial flats. Payable gold has been found in the bed of the Palmer R. more or less continuously for 100 m.
The Batavia R. field.	Derived from small but rich quartz-reefs in granite, is confined almost entirely to alluvial leads at the base of the overlying Cretaceous rocks. Practically all the gold won came from one lead 1200 ft. long. A little tinstone accompanies the gold. The widespread cover of Recent sand makes prospecting difficult.
Brisbane Area—Macintyre Brook, opposite Sandy Ck., 33 m. WSW of Warwick.	In alluvial deposits.
Between Macintyre Brook and Condamine R., about 28 m. WSW of Warwick.	In alluvial deposits.
Pikedale Goldfield, 18–20 m. NW by N of Stanthorpe.	In alluvial deposits.
Broadwater Ck. and its tribs.	In alluvial deposits, associated with Cassiterite, Stannite, Sapphire, Diamond, Topaz, Zircon, and Amethyst.
Stanthorpe Mineral Field, 139 m. SW of Brisbane.	Associated with Cassiterite, Diamond, Sapphire, Topaz, Zircon, Spinel, Garnet, and Cairngorm.
Spring Ck. and its tribs., 2¼ m. W of Stanthorpe.	In alluvial deposits.
Camp Hill Range, head of Canal Ck., 28 m. W by S of Warwick.	In alluvial deposits.
Lucky Valley Goldfield, 10 m. SE of Warwick.	In alluvial deposits.
Dun's Gully, Talgai Goldfield, 3 m. W of Pratten, 21 m. WNW of Warwick.	In alluvial deposits.
Talgai Goldfield, 3 m. W of Pratten, 21 m. WNW of Warwick. At Big Hill Gully, Darkey's Flat, Friday Gully, Gladstone Gully, Gum-tree Flat, Louisa, Maccabie's Sawpit, Spring and Dunn's Gullies.	In alluvial deposits.
From mouth of Nerang Ck. to Tweed Heads, 49–69 m. SE of Brisbane.	In beach deposits, associated with Magnetite.
Banker's Hill near Crow's Nest, Rail. Station. (Ravensbourne), 34 m. NNE of Toowoomba.	In alluvial deposits, associated with Sapphire, Pleonaste, etc.
Seven-mile Diggings, 7 m. SE of Nanango, and 40 m. (by road) NW by W of Kannangur.	In alluvial deposits, associated with Ruby, Spinel, Sapphire (blue), Garnet (red), Topaz (white), and Zircon.
Currumbin Ck., 1 m. N of Point Danger, 69 m. SSE of Brisbane.	In beach deposits, associated with Silver, Platinum, Cassiterite, and Monazite.
Currumbin Ck., 1 m. N of Point Danger.	In beach deposits, associated with Magnetite.

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Maryborough—Gympie—In gullies near the divide between Degilbo and Stanton–Harcourt Runs, 63 m. W by N of Maryborough.	In alluvial deposits.
In gullies near Stony Ck., Stanton–Harcourt Diggings, Degilbo Run, 11 m. N of Degilbo rwly stn., 69 m. W of Maryborough.	In alluvial deposits.
Marodian Goldfield—at Colo Flat, 12 m. N by E of Kilkivan.	In alluvial deposits.
Brooya Station, Mary R., 20 m. NW of Gypmie.	In alluvial deposits.
Mt Ruby, ½ m. WSW of Glenbar Head Station, 20 m. W of Tiaro rlwy stn.	In alluvial deposits.
Chinaman's Ck., trib. of Mary R., near Mt Ubi, W of Blackhall Range, 15 m. W by S of Palmwoods.	In alluvial deposits.
Base of Mt Cooroora, near Pomona.	In shallow alluvial deposits.
Gympie Goldfield—at Nash's Nuggety, Sailor's, Walker's, and White's Gullies, Deep Ck., and in gullies and on alluvial flats, 'Two Mile', NW of Gympie.	In alluvial deposits.
St John's Ck. Goldfield, 16 m. SW of Eidsvold.	In alluvial deposits, associated with Silver.
McKonkey's Ck. Diggings, The Springs, between McKonkey's and Hungry Hill Cks., 16 m. SE of Eidsvold.	In alluvial deposits.
Gladstone goldfield—Cabbage Tree Ck., branch of Splinter Ck., near Mt Cannindah, 40 m. SW of Miriam Vale Station, 83 m. S of Gladstone.	In alluvial deposits.
Barmundoo (Tableland) Goldfield—at Digger's Ck., 28 m. S by W of Gladstone.	In alluvial deposits.
Diglum Ck., Barmundoo, 30 m. S by W of Gladstone.	In alluvial deposits.
Eastern Boyne Goldfield—at Chandler's Gully, 26½ m. S by E of Gladstone.	In alluvial deposits.
Machine Ck., E side of Boyne Range, about 15 m. S of Gladstone.	In alluvial deposits.
New Zealand Gully, E side of Boyne Range, 5 m. SE of Calliope, 17 m. SE of Gladstone.	In alluvial deposits.
Pancake Gully, E side of Boyne Range, 14 m. S of Gladstone.	In alluvial deposits.
Tucker's Gully, E of Boyne Range, 12 m. S of Gladstone.	In alluvial deposits.
Nuggety Gully, Calliope, 12 m. S of Gladstone.	In alluvial deposits.
Watercourses at head of Brennan's Flat, 3 m. SSE of Calliope.	In alluvial deposits.
Dog-leg Gully, trib. of Oakey Ck., 1 m. E by S of Calliope.	In alluvial deposits.
Gordon's Gully, head of Leixlip Ck., 4 m. SE of Calliope, and 16 m. S of Gladstone.	In alluvial deposits.
Seven-mile Diggings, 6 m. E of Calliope, 18 m. S of Gladstone.	In alluvial deposits.
Ten Men's Gully, trib. of Oakey Ck., 3 m. SE of Calliope, 15 m. S of Gladstone.	In alluvial deposits.
Raglan Goldfield—at Moonlight Gully, Two-mile Diggings, 3 m. S of Raglan rlwy stn., 37 m. (by road) WNW of Gladstone.	In alluvial deposits.
Mt Larcombe Scrub, about 6 m. SE of Raglan, 40 m. (by road) WNW of Gladstone.	In alluvial deposits.
Old Diggings, S of Mt Holly, about 4½ m. S of Raglan rlwy stn., 38½ m. (by road) WNW of Gladstone.	In alluvial deposits.
Two-mile Diggings, head of Fire Ck., about 3 m. S of Raglan rlwy stn., 37 m. (by rail and road) WNW of Gladstone.	In alluvial deposits.
Ulam Goldfield, 3 m. S of Toonda, 44 m. (by road) WSW of Gladstone.	In alluvial deposits.
Rockhampton Goldfield—Canoona Goldfield, 26 m. N by W of Rockhampton.	In alluvial deposits.

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Oaks View, 4 m. N of Oaks Station, 45 m. (by road) NNW of Rockhampton.	In alluvial deposits.
Cawarral Goldfield, 15 m. (by rail) NNE of Rockhampton.	In alluvial deposits.
Morinish Goldfield, 29 m. NW of Rockhampton.	In alluvial deposits.
Peter's Rush, Dee R., Mt Usher, 4½ m. NE of Mt Morgan rlwy stn., and about 28 m. (by road) SSW of Rockhampton.	In alluvial deposits.
Herbert Ck. Diggings, Bailey's Gully, 10 m. ESE of Herbert Ck. rlwy stn., 64 m. (by road) SW of Rockhampton.	In alluvial deposits.
Native Cat and Candle-light Cks., 6 m. W by S of Stanwell.	In alluvial deposits.
Box Flat, 3 m. down Dee R., 20 m. SSW of Mt Morgan, 44 m. (by road) SSW of Rockhampton.	In alluvial deposits.
Callide Ck. Gullies, 52 m. SW by W of Gladstone.	In alluvial deposits.
Glen Dee, Dee R., 5 m. ENE of Mt Morgan.	In alluvial deposits.
Four-mile Ck., near Moonmera rlwy stn., 24 m. (by rail) SSW of Rockhampton.	In alluvial deposits.
In gullies between North and Middle Peaks, near Moonmera rlwy stn., 20 m. (by rail) SSW of Rockhampton.	In alluvial deposits.
E of Mt Scott, near Moonmera.	In alluvial deposits.
Mt Victoria, 3 m. WSW of Mt Morgan, 27 m. (by road) SSW of Rockhampton.	In alluvial deposits.
Bowen Goldfield—Head of the Don R., about 39 m. S of Bowen.	In alluvial deposits.
Manton's Ck., trib. of Don R., about 39 m. S of Bowen.	In alluvial deposits.
Bunerba, ½ m. S of Don R., about 39 m. S of Bowen.	In alluvial deposits, associated with Chalcedony, Jasper, Lydianstone, Zircon, and Sapphire.
Normanby Goldfield, 46 m. S of Bowen.	Associated with a recent ironstone formation.
Magnetic Island—at head of Camoomilli Ck., Cleveland Bay, 5½ m. N of Townsville.	In alluvial deposits.
Cloncurry Goldfield—Fisher's Ck., 12 m. E by N of Cloncurry.	In alluvial deposits.
Pumpkin Gully, 12 m. E of Cloncurry.	In alluvial deposits, associated with Native Bismuth.
Mistake Ck., trib. of Gunpowder Ck., about 90 m. NW by N of Cloncurry.	In alluvial deposits.
Near Gorge in Cloncurry R., 20 m. S of Cloncurry.	In alluvial deposits.
Bell's Flat, Florence R., 33 m. S by W of Cloncurry.	In alluvial deposits.
Armstrong Gully, Top Camp Diggings, Cloncurry R., 24 m. S by W of Cloncurry.	In alluvial deposits.
Chinaman's Flat, Cloncurry R., Top Camp Diggings, 24 m. S by W of Cloncurry.	In alluvial deposits.
Mary Douglas Hill, Top Camp Diggings.	In alluvial deposits, associated with Native Bismuth and Bismutite.
Blackfellow's Gully, 2 m. Ck. Diggings, 23 m. S by W of Cloncurry.	In alluvial deposits.
Eastern Ck., trib. of Gunpowder Ck., Leichhardt R., 87 m. NW by W of Cloncurry.	In alluvial deposits.
Surprise Ck., Leichhardt R., about 70 m. NW of Cloncurry.	In alluvial deposits.
Head of Copper-mine Ck., Leichhardt R., near Mighty Atom Copper Mine, 42 m. NW by W of Cloncurry.	In alluvial deposits.
Branch of Dobbyn Ck., Leichhardt R., 70½ m. NW of Cloncurry.	In alluvial deposits, as traces in granite country.
Clermont Goldfield—In gully, left bank of Sellheim R., near Mt McConnell, Sellheim Mineral Field.	In alluvial deposits.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
White Gates, Apsley Ck., 4 m. NNW of Clermont Goldfield.	In alluvial deposits.
Blue Ground, Black Ridge, 12¾ m. N. by W of Clermont.	In alluvial deposits.
Fiddler's Ck. Leads, 6 m. NW by N of Clermont.	In alluvial deposits.
Flyspeck, McDonald's Flat, 4½ m. SSE of Clermont.	In alluvial deposits.
In the gullies at McDonald's Flat, 3 m. S by E of Clermont.	In alluvial deposits.
Sandy Ck. Leads, close to Clermont Township.	In alluvial deposits.
Wild Cat, Kitten, and Bower Bird Leads, 1 m. S of Clermont.	In alluvial deposits.
In the gullies at Copperfield, 5 m. SSW of Clermont.	In alluvial deposits.
Drummond Ck., Copperfield, 3 m. SW of Clermont.	In alluvial deposits.
In gullies between Clermont, Drummond, and Douglas Cks.	In alluvial deposits.
Blacksmith's Gully, Four-mile Flat, 10 m. WNW of Clermont.	In alluvial deposits.
Hurley's Deep Lead, 12 m. NW by N of Clermont.	In conglomerate.
Native Bee Diggings, 9 m. W by N of Clermont.	In alluvial deposits.
Bath Ck., Venus, 10 m. NW by N of Clermont.	In alluvial deposits.
Mt Walker, 1 m. NW of Venus, 11 m. NW by N of Clermont.	In alluvial deposits.
Old Four-Mile Lead, 1¼ m. WNW of Venus, 10 m. NW by W of Clermont.	In alluvial deposits.
Venus Flat, Bath Ck., Venus.	In alluvial deposits.
Theresa Ck., Peak Vale Station, 18 m. SSW of Clermont.	In alluvial deposits.
Boulder Hill, Bootlace, Mill's Ck., Boulder Gully, Miclere, 20 m. N by W of Clermont.	In alluvial deposits.
Black Johnson's, ½ m. W of Seventeen-mile Hill, 14 m. NW by W of Clermont.	In alluvial deposits.
Seven-mile Diggings, Seven-mile Gully, 16 m. NW of Clermont.	In alluvial deposits.
Between Seven-mile and Two-mile Diggings, 15 m. NW by W of Clermont.	Associated with Ironstone, in alluvial deposits.
Gullies leading from Spurs on Drummond Range, 16 m. NW of Clermont.	In alluvial deposits.
Mackay—Mine Ck., trib. of Black Waterhole Ck., 5 m. N by E of Hazeldean, 40 m. SW of Mackay.	In alluvial deposits.
Mt Britton Goldfield—at Moonlight Ck., 75 m. (by road) SW of Mackay.	In alluvial deposits.
Gullies at the head of Bee Ck., Broken R., 60 m. W of Mackay.	In alluvial deposits.
Branches of Black Waterhole Ck., 2 m. N by E of Hazeldean, 24 m. SW of Mackay.	In alluvial deposits, associated with Garnet and Zircon.
Charters Towers—Bluff Lead, Canton Lead, and Pothole Lead, Upper Cape Diggings, 17 m. W by N of Cape R. rlwy stn., 77 m. SW (by road) of Charters Towers.	In alluvial deposits.
In gully near Old Homestead Reef, 46 m. WSW of Charters Towers.	In alluvial deposits.
Torrens Ck., 98 m. SW by S of Charters Towers.	In alluvial deposits, associated with Ilmenite.
Broken R., 3 m. above Dosey Ck., 108 m. WNW of Charters Towers.	In alluvial deposits.
Cornish Jim's Gully, 3 m. N by E of Mt Leyshon, 19 m. S of Charters Towers.	In alluvial deposits.
Cape R. Goldfield—at Mt Black, 9 m. W of Upper Cape, 26 m. W by N of Cape R. (62 m. WSW of Charters Towers).	In alluvial deposits, in gullies of quartzite.
In watercourses at Mt Davenport, 4 m. NW of Cape R. rlwy stn., 70 m. SW by W of Townsville.	In alluvial deposits.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Escort or Stone Ck., Golden, Graveyard, Green's, Long, Moran's Nuggety, Paddy's, Quartzite, Sharper's Specimen, and other gullies. Mt Remarkable, 6 m. W by N of Pentland.	In alluvial deposits.
In gully on range 5 m. up Ready Ck., opposite Mt Richardson, 18 m. W by N of Cape R rlwy stn.	In alluvial deposits.
Chinaman's Gully, Gahn's Flat, Milkonan's Point. Red Hill, between Rocky and Sandy Cks., and on the S side of Sandy Ck., Lower Cape, Capeville.	In alluvial deposits.
Ravenswood Goldfield—Mt Wyatt Goldfield, 60 m. SSE of Ravenswood.	In alluvial deposits.
Greasy Bill's Gully, 3½ m. NNE of Mt Leyshon.	In alluvial deposits.
Gully ½ m. N of Arthur's Ck., Far Fanning, 28 m. (by road) NW of Ravenswood Junction.	In alluvial deposits.
Watercourses at Mt Success, 15 m. WNW of Ravenswood Junction.	In alluvial deposits.
Ravenswood Goldfield—at Connolly Ck., trib. of Burdekin R., 78 m. S of Townsville. Jessop's and Buchanan's Gullies, trib. of Elphinstone Ck., ½ m. SSW of Ravenswood.	In alluvial deposits.
Graphite	
Jack's Ck., S of Collinsville, which is 45 m. SW of Bowen.	Graphitic material is distributed through two bands of steeply-dipping sediments, 15 ft. and 9 ft. thick, separated by a low-grade band 14 ft. wide, in shale and sandstone.
Mt Bopple and Beacon Peak, 27 m. N of Gympie.	Several seams of amorphous graphite have been found on the flanks of a ridge joining Mt Bopple and Beacon Peak. The graphite seams were originally carbonaceous shale beds in the Burrum Coal Measures, which were metamorphosed by contact with nearby syenite and horneblende andesite intrusives.
Croydon, 240 m. SW of Cairns.	Individual lenses are about 300 ft. wide and ½ to 1 m. long.
Watsonville, 7 m. W of Herberton.	A rock similar to the Croydon graphitic granite is reported to occur.
Ebagoola, 40 m. S of Coen.	Minor occurrences of graphite occur.
Cape Upstart, N of Bowen.	Minor occurrences of graphite occur.
Homebush and Scrubby Ck. near Mackay.	Minor occurrences of graphite occur.
Greenbank, near Mt Perry.	Minor occurrences of graphite occur.
Gypsum	
Pulchara Waterhole on the Mulligan R.	Deposits of good quality material have been reported.
Rosebrook Station, on the Mayne R. in Wstn Qld.	Deposits of good quality material have been reported.
30 m. W of Adavale, 115 m. WNW of Charleville.	Gypsum bearing clay is widely distributed in a region.
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Tweed Heads to Fraser I.	Heavy mineral deposits occur on or behind most of the beaches on this stretch of coast line. The deposits are in one or two forms, those on present-day beaches and those on former beaches which lie buried under the coastal sand dunes and under the heath land which is found behind the dunes. On North Stradbroke I. are large dunes which comprise low grade deposits of heavy minerals blown up from earlier beaches. The beach deposits are concentrated by heavy weather and surf on the upper part of the beaches in a seam up to 50 ft. wide. In calm weather this seam is covered by quartz sand. The dune deposits consist of several seams

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	separated by quartz sand running parallel to the beach. The heath land deposits are usually 10 to 20 ft. above present high water level and are old beach and dune areas levelled by erosion. The heavy mineral content of the seams can be as high as 90 percent by weight. Originally the average was 10 percent by weight but the percentage has gradually dropped as lower grade deposits behind the present beaches are worked.
Heavy minerals have been worked from most of the beaches between Tweed Heads and Noosa, 80 m. N or Brisbane at one time or another. The most important area of production was North Stradbroke I.	
Round Hill area, 50 m. S of Gladstone.	Three separate dune deposits over a stretch of 25 m. of coast line carry 5 to 9 percent heavy minerals.
Curtis I. off the coast between Gladstone and Rockhampton.	Bores were put down over a 35 acre area of sand. These bores indicated a fairly consistent grade of over 3 percent heavy minerals.
Waterpark Point (25 m. N of Keppel Bay) to Cape Clinton (30 m. further N).	Reserves of heavy minerals in excess of 200,000 tons contained in five separate beach deposits.
North of Cape Clinton the Great Barrier Reef has a sheltering effect on the coastline and the concentrating effect of the sea is reduced. No important deposits are known.	
Urquhart Point, W side of Cape York Peninsula.	Low dunes in this area contain a high grade deposit of mineral sands averaging 32 percent heavy minerals.
Iron	
Constance Range, abt 160 m. NW of Mt Isa.	Sedimentary iron-rich beds outcrop, or underlie, about 250 sq. m. in the Constance Ranges. The iron minerals are hematite, siderite, chamosite and pyrite.
Iron Range, near the E coast of Cape York Peninsula.	Consist of several unconnected lenses of hematite closely mixed with metamorphosed sediments.
Dawson Vale, Springvale, Cockato and Bungaban station properties in the Dawson Valley, 15 to 20 m. S of Cracow.	Iron deposits have been reported.
Mt Oxide, 45 m. NW of Dobbyn; Mt Leviathan and Mt Philip, near Cloncurry; Hematite Range, W of Kajabbi; Wild R. in the Herberton Area; Mt Lucy near Almaden; Black Ck., W of Mt Garnet; Willets Knob, N of Ewan; Iron I., 50 m. NE of St Lawrence; and Glassford Ck. near Many Peaks.	Iron deposits have been reported.
Lead and Zinc	
Mount Isa, a mining town 603 m. (by rail) W of Townsville (silver-lead-zinc).	Base metal mineralization in a belt of Proterozoic shale stretching over many miles. This deposit has made Queensland the second largest producer of lead and zinc in Australia. Drilling over recent years has proved ore reserves that could make the area Australia's top producer in the near future.
Burketown mineral field near Lawn Hill, 150 m. NNW of Mt Isa (silver-lead-zinc).	Galena, and sphalerite with small amounts of pyrite, and chalcopyrite in a quartz siderite gangue found in fissure lodes in faulted sandstone, shale and acid volcanics.
Dugald R. prospect, 36 m. NW of Cloncurry.	Drilling has indicated a large tonnage of silver lead zinc ore in contorted graphitic shales.
Chillagoe–Herberton area, 60 m. WSW of Cairns (lead-zinc).	Second only to Mt Isa as a lead producing area in Qld. Production almost ceased on closure of smelters in 1939. Many deposits associated with

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	limestone but some in greywacke or conglomerate. Most deposits were small and in many mines only the oxidized part was worked.
Ravenswood Region, 60 m. S of Townsville (silver-lead-zinc).	Silver-lead-zinc lode along a shear in quartz diorite.
Ukalunda area, 60 m. SSE of Ravenswood (silver-lead-zinc).	Veins of galena with some sphalerite and pyrite, associated with dolerite sills intruding sandstone and shale.
Etheridge field, 180 m. SW of Cairns (silver-lead).	Small silver-lead deposits in quartz reefs in slate.
Small amounts of lead have been produced from:	
Charters Towers.	By-product of gold concentrates.
Indooroopilly.	Associated with ryolite dykes.
Silver Spur, 10 m. E of Texas.	Crush zones in mudstone.
Liontown, 30 m. SW of Charters Towers.	Veins in sheared mica schist.
Forsyath area 180 m. SW of Cairns.	Fissure lodes.
Some lead production has been recorded from the following areas: Bloomsbury, 50 m. NW of Mackay; Bompa, 48 m. S of Gladstone. Emu Ck., 15 m. SE of Yarraman; Ewan, 40 m. SSW of Ingham; Mt Barker, 50 m. W of Mackay; Mt Prospect, 60 m. SSW of Gladstone; Mt Shamrock, 20 m. E of Gayndah; Clermont; Gympie; Glenbar; Mt Coolan; Mt Perry; Rockhampton.	
Zinc is associated with lead in many Qld. deposits but apart from Mt Isa the only production of zinc reported is from the Chillagoe district, Bowen district and Silver Spur.	
Manganese	
Deposits occur in a belt 50 m. long and 7 m. wide in the upper Mary Valley, SW of Gympie.	Most of the deposits are small and lenticular, extending only to a shallow depth.
Gladstone district—Mt Miller, 5 m. W of Gladstone.	The deposit has a lenticular appearance. The manganese is confined to the upper beds and is interbedded with jasper and slate.
Cairns area—Mt Martin and Wright's Ck.; Mossman, 30 m. N of Cairns.	
Deposits occur in a belt extending from Cloncurry to Mt Cobalt, 70 m. to the S. The largest deposit is at Overhang, 24 m. SW of Cloncurry.	
Manganese occurs 2 m. W of Bunzalien rlwy stn. on the Cloncurry–Duchess line.	
Deposits occur 30 m. SE of Dajarra.	
Colless Ck., W of Lawn Hill.	Small concentrations of manganese minerals occur in Middle Cambrian chert breccia near Colless Ck.
Mercury	
chief ore mineral of mercury is cinnabar.	
Kilkivan, which is 28 m. WNW of Gympie.	Numerous cinnabar deposits are known within an area 50 sq. m. to the NW, W and S of Kilkivan. Cinnabar occurs in small rich veins. The veins range in width from a fraction of an inch up to several feet. Calcite, siderite, quartz and limonite are associated with the veins.
Monsildale deposit is situated at Brown's Ck., 63 m. NNW of Brisbane.	Cinnabar ore was obtained from a narrow seam of clay, which follows joints in igneous rocks of the area.
Little R., 8 m. WSW of Cooktown.	Cinnabar is present in calcite veins in a band of clay.
Mt Mee, 40 m. NNW of Brisbane.	Small amounts of gold and cinnabar have been reported in the stream gravels.
Mica	
Morehead R. or 'Looking Glass' mica mine, 106 m. by road NW from Laura.	Muscovite is contained in a large pegmatite body, 360 ft. long and up to 100 ft. wide.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Mt Kitchin, abt 40 m. W of Mungana in the Chillagoe district.	Muscovite occurs in pegmatite dykes, which intrude schists.
Mica Ck., 8 m. S of Mt Isa.	Muscovite occurs in pegmatite dykes associated with tin, tantalite, beryl and monazite.
Blackbutt, 114 m. by rail NW of Brisbane.	Vermiculite occurs in quartz veins in aplitic granite, close to a granite slate contact. The vein ranges from 5 to 11 in. in width.
Moonmera, 19 m. by rail W of Rockhampton.	Vermiculite occurs in granite veins.
10 m. SSW of Home Hill.	Vermiculite occurs in several places in schist and gneiss.
Molybdenite	
Wolfram Camp field, 15 m. WNW of Dimbulah on the Cairns–Forsayth rlwy.	Molybdenite is associated with wolfram and bismuth in quartz pipes near the edge of granite.
Bamford, 1½ m. NNW of Petford on the Cairns–Forsayth line.	Molybdenite associated with wolfram and bismuth in quartz pipes.
Khartoum, 21 m. SSE of Chillagoe; Tinaroo, 14 m. SE of Mareeba; Koorboora, 108 m. from Cairns on the Forsayth line; Fischerton, 25 m. SSW of Chillagoe; Rose's Ck., 12 m. S of Fischerton; Mt Carbine, 22 m. NW of Mt Molloy.	A series of molybdenite-bearing lenses occur in quartz reefs in fine grained granite.
Mt Perry district: Wonbah Mine, 8 m. N of Mt Perry, approx. 40 m. WSW of Bundaberg; Mt Bania, 21 m. NNW of Mt Perry.	Deposit is in quartz pipe in granite.
Wangool, 3½ m. WSW of Mt Perry.	A number of small quartz pipes were prospected.
Ollera Ck., 3 m. SW of Moongabulla Siding, 39 m. N of Townsville.	Molybdenite is associated with wolfram and bismuth in joints and pipes in a coarse grained granite near its contact with quartz porphyry.
Coen in Cape York Peninsula.	
Kangaroo Hills, 30 m. SW of Ingham.	
Copperfield Ck., 37 m. S of Einasleigh.	
Nickel	
Cloncurry, Mt Isa district.	Small amounts of nickel have been found in ore from some of the cobalt-copper mines of the area.
Black Snake, near Kilkivan.	Traces of nickel found with cobalt and copper.
Gray Ck., 90 m. Copper Mine area near Greenvale, Nth Qld.	Deposits occur in weathered serpentine.
Pine Mountain, N of Ipswich.	These also occur in weathered serpentine.
Ortona Copper Mine, 60 m. S of Forsayth.	Associated with cobalt.
Deposit near Rockhampton.	Large areas of low-grade lateritic nickel deposits.
Near Greenvale.	Large low-grade lateritic deposits occur.
Near Marlborough.	Lateritic nickel deposit occurs.
Platinum	
Osmiridium, Palladium.	
Sthn part of E coast of Qld.	Detected in beach sand deposits.
Westwood near Rockhampton.	In small auriferous veins in fractured diorite.
Quartz Crystal	
Cloncurry (Duck Ck.); Palmer R. district; Petford, 62 m. SW of Cairns.	Deposits have been reported.
Wolfram Camp Field, 55 m. WSW of Cairns.	At the Wolfram Camp Field in the Enterprise mine quartz crystal occurs in a vug in a pipe at a depth of 300 ft.
Croydon Mornish, 25 m. NW of Rockhampton.	Deposits have been reported.
Wonbah Nob, 40 m. WSW of Bundaberg.	Deposits have been reported.
Stanthorpe area, sthn Qld.	Deposits have been reported.
Silver	
Mt Isa.	In the silver, lead, zinc ore bodies of the Mt Isa field in solid solution with the galena. Other silver minerals noted are tetrahedrite, proustite and poly basite.
Cloncurry Field W of Duchess.	An occurrence of selenide of silver, naumannite, with native silver and cerargyrite associated with calcite in a joint in hornblende schist.

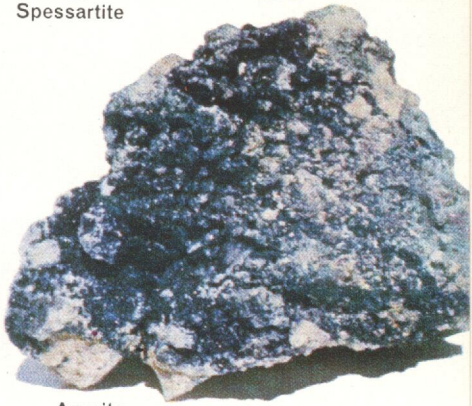
Stolzite

Quartz

Pyromorphite

Spessartite

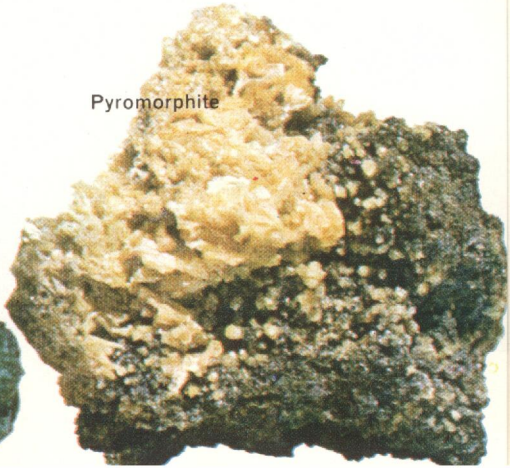
Smithsonite/Calcite/Gypsum Crystals

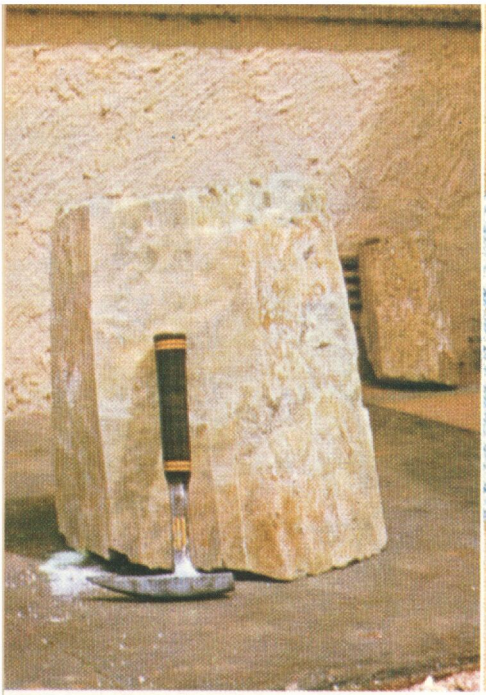


Azurite

Chrysocolla

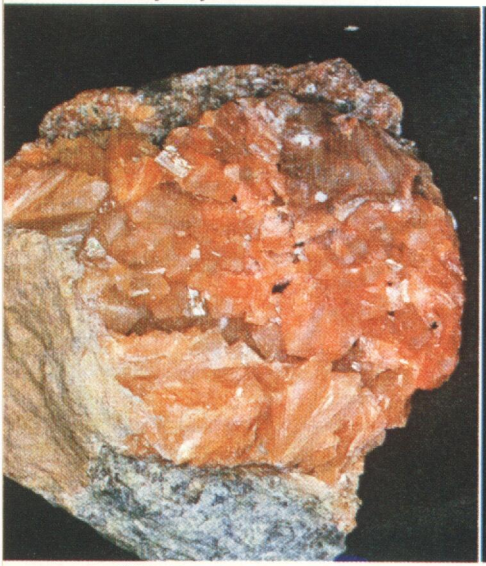
Pyromorphite





Beryl Crystal

Chalcanthite



Stillate

Gypsum Crystals

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Agate Downs W of Kuridala.	Small rich deposit of cerargyrite and native silver in a fracture in granite.
Dugald R., 36 m. NW of Cloncurry.	Unworked reserves of ore (1,000,000 tons) containing silver, lead, zinc.
Lawn Hill, 150 m. NNW of Mt Isa.	High grade fissure lodes of silver, lead, zinc. Most production from the Silver King mine.
Chillagoe–Herberton district—Mungana.	Mines in the district around Mungana produced millions of ounces of silver. Two of the more important mines were the Girofla, and the Lady Jane. Another was the Chillagoe Consols mine near Chillagoe.
Other localities in the Chillagoe–Herberton district: Copper Mine; Crooked Ck.; Dargalong; Irvine Bank; Koorboora; Lappa Lappa; Mitchell R., Mt Albion; Muldiva; Newellton; Orient Camp; Red Cap; Silverfield; Stannary Hills; Tartana.	
Etheridge field, 150 m. SW Cairns; Georgetown Forsayth section of field.	Silver lead deposits in quartz reefs; also from copper and gold deposits.
Oaks goldfield, adjoining the Etheridge field.	Silver is a constituent of the gold deposits.
Ewan in the Kangaroo Hills field; 40 m. SSW of Ingham.	Lenses of silver-lead and copper ores along contact of quartz porpyhry and limestone.
Star R. area, 30 m. SE of Ewan.	Silver lead lodes in granite, and metamorphosed sedimentary rocks.
Ravenswood area, 60 m. S of Townsville.	Silver lead lode in a shear in granite other silver minerals are tetrahedrite, pyrargyrite, proustite, and argentite. Silver was also recovered from the Ravenswood gold mines.
Sellheim Silver Mines nr. Ukalunda, 60 m. SSE of Ravenswood.	Fissure lodes in Devonian shale and sandstone and in dolerite intruding these sediments. The main ore is galena.
Charters Towers goldfield.	Silver produced from gold ores.
Cape River goldfield.	Silver produced from gold ores.
Lolworth.	Silver produced from gold ores.
Liontown, 25 m. SW of Charters Towers.	Silver lead veins associated with fractures in mica schist.
Mt Morgan copper-gold mine, 20 m. SW of Rockhampton.	Small silver production from primary ore.
Mackay district: Silver has been produced from the following small copper and lead deposits in the district.	
Mt Barker, 50 m. W of Mackay.	Silver-lead mine.
Mt Chalmers, 10 m. NE of Rockhampton.	Copper-gold mine.
Pinevale, 25 m. SW of Mackay.	Copper mine.
Mt Perry district, 50 m. WSW of Bundaberg.	Silver produced from gold-copper ores of the Mt Perry and Normanby lodes.
Glassford Ck.; Many Peaks; Mt Cannindah on the headwaters of the Boyne and Burnett Rs., 50 m. S of Gladstone.	Silver as a by-product of copper mining.
Silver Spur, 10 m. E of Texas.	Silver associated with galena, chalcopyrite, sphalerite and gold in lenses in Permian shale.
Silver was produced from the Cracow, Gympie and Black Snake goldfields.	
The following Qld locations also yielded silver: Biggenden; Cape York Peninsula; Clermont near Monto; Croydon goldfield; Dittmer (Proserpine).	On the goldfields.
Indooroopilly (a Brisbane suburb).	Silver lead mines.
Jordon goldfield (Innisfail).	On the goldfields.
Mt Coolon, 110 m. SSW of Bowen.	On the goldfields.
Mt Peter (near Cairns).	On the goldfields.
Mt Prospect, 60 m. SW of Gladstone.	Silver lead mines.
Nawango; Normanby goldfield (near Collinsville); Palmer Goldfield, 60 m. SW of Cooktown; Warwick district.	On the goldfields.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Tin	
Volcan Mine, near Irvinebank.	The deposit consists of a quartz-chlorite pipe in steeply dipping bed of massive greywacke, and contains tin and magnetite and small amounts of galena and chalcopyrite.
Smith's Ck., 7 m. SW of Mt Garnet.	Rich alluvial deposits occur.
Bottle Ck., 5 m. E of Mt Garnet.	Rich alluvial deposits occur.
Nettle Ck., 9 m. E of Mt Garnet.	Rich alluvial deposits occur.
Return Ck., 2 m. W. of Mt Garnet.	Rich alluvial deposits occur.
Near Herberton.	
Emuford, Gurrumba, Sunnymount and Koorboora area, 30 to 45 m. W of Herberton.	Tin lodes occur through the sedimentary rocks of the area, sulphides occur in minor amounts, lead and zinc being common.
Round Mountain and Truxillo in the Fossilbrook area, 70 m. WSW of Herberton.	Tin has been mined from alluvial deposits.
Tate Tin Mine, 25 m. N of Fossilbrook.	
Lancewood and Angor, 35 m. W of Fossilbrook.	
Tin has been mined over an area of 200 sq. m., 25 m. S of Cooktown.	Tin deposits occur in tourmaline-rich quartz and feldspar veins and in granite near their contact.
Kangaroo Hills, 40 m. SW of Ingham.	Area consts of slate, quartzite and tuff intruded by granite.
Stanthorpe, 139 m. SW of Brisbane.	It is a continuation of the New England granite complex. Tin is associated with the granites.
Port Douglas; Palmer R.; Ravenswood; Star R., Tinvale, N of Charters Towers.	Small amounts of tin have been reported.
Tungsten	
Bamford–Petford area: Bamford is 1½ m. NNW of Petford on the Cairns–Forsayth rlwy.	Quartz pipes in a greisenized zone at the margin of granite intrusive into quartz porphyry. Ore minerals are wolfram, molybdenite and bismuth with a small amount of scheelite.
Mt Carbine, 22 m. by road NW of Mt Molloy.	Shoots in pegmatite veins near the edge of granites, the country rocks are slate and schist, intruded by dolerite enrichment, occurs where veins transact the dolerite dykes. Ore mineral is scheelite.
Wolfram Camp, 15 m. by road WNW of Dimbulah on the Cairns–Forsath rlwy.	Pipe-like bodies of quartz in greisenized zones within granite near its contact with shale, greywacke, grit, and intrusive quartz porphyry. Ore minerals, wolfram, molybdenite and native bismuth with minor quantities of scheelite and sulphides.
The following centres in the Chillagoe–Herberton–Mareeba district have produced appreciable tonnages of wolfram:	Quartz pipes or veins in or near the edge of granites.
Coolgarra Galala; Brodie's Camp; Glenlinedale; Fischerton; Sunnymount; Koorboora; Emuford.	At Koorboora chlorite is an important constituent of the veins.
Mt Perseverance.	At Mt Perseverance the main granite mass is 1½ m. from the field. The wolfram occurs in quartz feldspar veins.
Other Qld centres from which worthwhile amounts of wolfram have been produced are:	
Banks I.; Bowden field, Pascoe R. district, 240 m. N of Cooktown; Kangaroo Hills field.	Quartz pipes or veins.
30 m. SW of Ingham.	Quartz pipes or veins (fluorite is an important constituent of this deposit).
Moongabulla siding on the Townsville–Cairns rlwy.	Quartz pipes or veins.
Ollera Ck., 3 m. SW of Moongabulla Siding.	Quartz pipes or veins.
Star R. Headwaters, W of Ollera Ck.	Quartz pipes or veins.
Other localities from which wolfram has been produced: Bismuth Ck. (Ethridge district); Cloudy Clearing (Charters Towers district); Kajabba area (Concurry district); Kildare (Eidsvold district).	Ore hubnerite.

QUEENSLAND

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Little More (in the Boyne Valley); Mt Fox, 10 m. NE of Kangaroo Hills; Mt Leyshon (Charters Towers district); Mt Romeo S of Cooktown; Noble I. 70 m. N of Cooktown; Percyville (in the Ethridge district); Perry Ck., 30 m. WNW of Kangaroo Hills; Rosedale, 30 m. NW of Bundaberg; Stanthorpe district; Wyarra (in the Bowen district).	Wolfram and scheelite produced at Perry Ck.

NORTHERN TERRITORY

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Asbestos	
Hart's Range, 130 m. NE of Alice Springs.	Narrow veins of cross-fibre were found, but is of poor quality.
Barite	
Fletcher's Gully area S of Daly R. Dorisvale homestead, which is 55 m. W of Katherine.	The lodes are up to 20 ft. thick.
Bauxite	
Gove, between Melville Bay and W side of Gulf of Carpentaria.	The Gove deposits were formed on felspathic sediments which overlie garnetiferous granite. They cover an area of 40 sq. m. and consist of four separate deposits. The barite occurs as nodules of bauxite to a depth of 18 ft.
Marchinbar I., a large island at NE end of Wessel Group off NE Arnhem Land.	Eight groups of bauxite deposits occur on the island. In places the bauxite is covered by thin layers of sand. Most of the bauxite is massive.
Croker I. off NW Arnhem Land.	
Beryl	
Hart's Range/Plenty R. area, 120 m. E of Alice Springs.	In pegmatites associated with potash feldspar.
Wolfram Ck., 28 m. ESE from Pine Ck.	Beryl crystals at Kelly's Tin mine.
Bismuth	
Hatches Ck., 290 m. NE of Alice Springs.	Bismuth is associated with wolfram and scheelite and a little gold and chalcopyzite.
Tennant Ck., 313 m. N of Alice Springs.	Bismuth minerals occur in the gold and copper ore of many mines in the district.
Yeuralba, 30 m. NW of Maranboy.	Associated with wolfram-scheelite-bismuth.
Cobalt	
chief ore minerals of cobalt are smaltite, cobaltite, erythrite and asbolite.	
Rum Jungle, 55 m. ESE of Darwin.	Primarily a uranium deposit and was worked as such, but copper, lead, nickel and cobalt also occur.
Copper	
Home of Bullion Mine, 22 m. NE of Barrow Ck., which is 176 m. N of Alice Springs.	
Jervois Range, 160 m. NE of Alice Springs.	Sporadic copper mineralization outcrops along a strike length of 6½ m. over an average width of 2000 ft.
Daly R. area, 80 m. S of Darwin.	The deposits occur at irregular intervals over a distance of abt 8 m.
Rum Jungle, 40 m. S of Darwin.	Copper was obtained as a by-product of the uranium mining.
Tennant Ck. goldfields, 313 m. N of Alice Springs; The Peko mine.	Large-scale mining at the Peko mine began in 1952. The ore body, at the outcrop, is a quartz-hematite body but at depth it contains a central core of very coarse breccia-conglomerate whose matrix is almost completely replaced by magnetite and sulphides.
Garnet	
Hart's Range Mica Field, 120 m. E of Alice Springs.	Abundant in wall zones and borders of pegmatites
Gold	
Most of the gold deposits which have been worked in North Australia are contained in a great number of small fields lying within a radius of 45 m. from Pine Ck., which is on the rlwy line some 120 m. SSE of Darwin. Apart from alluvial deposits the gold occurs in ore-bodies of two principal types, quartz reefs and quartz ironstone lodes.	
Pink Ck. Field—Narrow belt of sediments tending NW between two outcrops of granite surrounded by hornfels.	Formerly greatest gold producer in North Australia, producing 2 million dollars of alluvial gold. Richer auriferous reefs have all been mined to water level but large quantities of low-grade ore still remain.

NORTHERN TERRITORY

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Union Reefs Field—Few miles NW of Pink Field.	Slates and phyllites traversed by numbers, shears and faults. Ore-bodies in two main shear zones consist of groups of subparallel reefs arranged *en echelon*. Numerous small quartz-veins and reefs running obliquely to shear-zones have proved richer than the larger reefs. Surface gold-yields were very high—up to 80 oz. to the ton.
Brock's Ck—In the Britannia and Zapopan, Fountain Head, Yam Ck., Iron Blow, Golden Dyke and other mines.	Deposits worked in the past. Most of country alluvium-covered, with occasional low rock outcrops.
Pine Ck.—About the headwaters of Wandie Ck. At Wandie and Driffield mines and elsewhere.	Rich veinlets were mined but most of ore unpayable. Quartz-ironstone reefs at Mt Todd proved the richer. Gold values fluctuate as high as 34 dwt. to the ton in shoots.
Maude Ck.—60 m. SE of Pine Ck.	Poor quality reefs of quartz-ironstone type, chiefly in volcanic rocks.
Daly R. District—Some 80 m. WSW of Pine Ck.	Chiefly tin-mining, but gold mined at Fletcher's Gully in veins rich in the upper levels but too small for profitable working.
Tanami Field.	Area mined is 2½ m. long by ½ m. wide. Workings concentrated along an eastern line about 6200 ft. long and a western 1100 ft. long. Most gold won from northern part of the field. The ore-bodies are a series of lenticular quartz-reefs filling fissures and containing free gold. Along western line, parts of the country-rock susceptible to impregnation and gold-deposition. A few auriferous quartz-hematite reefs are known.
Tanami District—Gold occurs at wide intervals over area of about 11,000 sq. m. S and E of Tanami, up to Tennant Ck. At The Granites field, 60 m. SE of Tanami.	Component rocks, mostly schists and phyllites with sandstones and quartzites, are invaded by granite forming prominent outcrops. Ore-bodies are fissure-veins in the more competent and impregnated zones in the more porous rocks. Gold in ironstone lodes to the W may develop into ore-bodies with large tonnages of low-grade ore. Mineralized zones nearly 3000 ft. long and as much as 80 ft. wide, probably contain shoots of gold, but much exploratory work remains to be done.
Tennant Ck.—Dominant rocks are phyllites folded along E–W axes.	Mineralization connected with intrusions of granite. Chief ore-bodies are metasomatic lenses and pipe-like masses of hematite arranged *en echelon* along cleavage-planes. These are seen at the surface in all stages of denudation. Geophysical exploration reveals presence of at least 24 concealed ironstone bodies of considerable size at depths of 100–800 ft., some being auriferous. Gold present in lodes sporadically and in rich shoots. Average yield a little more than an ounce to the ton.
Macdonnell Ranges—Extending N to Barrow Ck.	Composed largely of the paragneisses, schists, dolomites and quartzites of the Arunta Series, and invaded by basic rocks and granites. Gold, silver-lead and copper minerals occur in varying proportions.
At Winnecke, 45 m. NE of Alice Springs, and Arltunga fields.	Ore-bodies tend to dip with country in the schists. Irregular and complex fracture-systems hamper mining development at depth. In ferruginous quartz of the oxidized local enrichment is evident, but yields have been low. Mines have been put down within 4 m. radius of Arltunga.
At Glankroil, N of Winnecke's Well.	Gold accompanied by galena, copper carbonates and quartz. Ore-bodies venicular and occupy fissures trending NNE.

NORTHERN TERRITORY

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
At White Range.	Country-rock is quartzite which shows a progressive change in direction from NW through N to E. Fault and fissure systems formed which served as ore-channel. The ore-bodies, which are quartz-reefs, are associated with major and minor fractures, joints and bedding planes and are generally very irregular. Up to 300 ft. in length and 17 ft. wide. Reef-outcrops are composed of somewhat cellular quartz-ironstone gossan. Gold-values found to increase downwards, but below water level gold varied according to the abundance of the sulphides. Average gold-yield 1 oz. to the ton. Four principal lines of lode have been worked to a depth of 60 ft.
At Claraville.	Some very rich veins and reefs but their distribution very irregular.
Graphite	
Golden Dyke mine area, 90 m. S of Darwin.	The graphite occurs in slates which outcrop in the area.
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Blaze Point, 60 m. SW of Darwin.	Sands containing heavy minerals occur between the dunes and the sea.
Kuli Impini Beach; Melville I.	Black sand deposit on the beach containing zircon, rutile, ilmenite and monazite. The deposit of mineral sands contains 16,000 cu. yds. of material above the water table and has an overburden of 20,000 cu. yds.
Beach sand deposits are also reported from: Bathurst I.; Caledon Bay; Goulburn I.; Fitzmaurice R.	
A rutile deposit is known to occur near Oenpelli Mission NE Arnhem Land.	
Iron	
Roper R., Hodgson Downs area, near the Gulf of Carpentaria.	The iron stone occurs in beds in two basins and near the Roper R.
Burrundie district in an area approx. 8 m. by 4 m. in the vicinity of Maude and Francis Cks., abt 100 m. SE of Darwin.	Six ironstone outcrops occur in this area.
Mt Bundey, 60 m. SE of Darwin.	A deposit of hematite outcrops.
Pine Ck., Adelaide R. and Finniss R., all within 100 m. S of Darwin.	Iron has been reported.
Lead and Zinc	
Pine Ck. area, 110 m. SSE of Darwin.	Small and irregular lodes of silver-lead-zinc in limestone.
	Also a copper-gold-silver-lead-zinc ore of a quartz-pyrite type occurring in slate and sandstone.
McArthur R. Homestead, 30 m. SSW of Borroloola.	Silver-lead-zinc-copper deposits occurring as vugs and small veins in dolomite or chert breccia.
H.Y.C. 2 m. NNE of the McArthur R. Homestead.	Large deposit of sphalerite with amounts of galena and minor copper and silver minerals.
Kilgour Gorge, 80 m. SSW of Borroloola.	Lead ore produced.
Jervois Range, 170 m. ENE Alice Springs.	Silver-lead-copper deposits in quartz-garnet-granulite lenses in archaean quartz mica schist.
Lead ore has also been produced from the following localities: Alligator R. area NW Arnhem Land; Home of Bullion Mine, 200 m. by road N of Alice Springs; Winnecke's Depot, 40 m. N of Alice Springs.	
Many of the lead deposits in the Northern Territory have zinc minerals present but no production of zinc is recorded.	

NORTHERN TERRITORY

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Manganese	
Renner Springs, approx. 80 m. N of Tennant Creek.	Two groups of deposits occur. The ore contains a high percentage of manganese.
Mucketty manganese deposit, 30 m. SE of Renner Springs.	Diamond drilling showed that the manganese mineralization does not continue to a great depth and the grade of the ore decreases down the dip.
Bootu Ck. area, 5 m. SE of the Mucketty deposit.	Over 500 tons of ore averaging more than 60 percent manganese oxide are exposed in a band 2–4 ft. thick extending for more than 400 ft. on each side of two hills.
Groote Eylandt.	The manganese deposits occur within an area of 4 to 6 m. to the SW of the main Mission settlement near the central-west coast of the island.
Mt Shoobridge W of Brocks Ck.	Deposit occurs as large boulders, embedded in soil at the foot of Mt Shoobridge.
Mica	
Hart's Range, lies abt 130 m. by road NE of Alice Springs.	Commercial deposits of muscovite occur in numerous pegmatite bodies distributed throughout the Harts Ranges. Most of the high quality muscovite is contained in coarse-grained pegmatites.
Plenty R. mica field; lies about 50 m. NE from the centre of the Harts Ranges.	Mica occurs.
Undippa field, abt 10 m. N of Hart's Range.	Mica occurs.
Pinnacle Well in the Strangeways Range.	Mica occurs.
Neutral Junction Station, 6 m. E of Barrow Ck. and abt 20 m. NW of Aileron Station, which is 80 m. NNW of Alice Springs.	Mica occurs.
Molybdenite	
Yenberrie, 23 m. SE of Pine Ck.	
Silver	
Evelyn Mine, 28 m. by road NE of Pine Ck.	Small, irregular silver, lead, zinc bodies in limestone.
Tennant Ck.	Silver is recovered as a by-product of copper and gold mining.
Small quantities of silver lead ore have been reported from the following localities: Fergusson R. near Hidden Valley, 30 m. SW of Pine Ck.; Flora Belle Mine near Boom Lera Siding; Gander Mine near Winnecke Depot; Home of Bullion Mine, 200 m. N of Alice Springs; Iron Blow Mine, 3 m. S of Grove Hill; Jervois Range, 170 m. ENE of Alice Springs; Kilgour Gorge, 81 m. SSW of Borroloola; McCarthy's Mine Uwatha Hills, 14 m. ENE of Pine Ck., Mt Gardiner, 21 m. ENE of Pine Ck.; Winnecke Depot, 40 m. NE of Alice Springs.	
Tin	
chief ore mineral of tin is cassiterite.	
Maranboy tinfield, 40 m. SE of Katherine.	The tin occurs in lodes in granite.
Pine Ck., 115 m. by rail from Darwin. (Principal ore is at Burrundie).	The cassiterite occurs in iron-stained quartz lodes some of which contain feldspar and mica.
Mt Harris tinfield further N of Burrundie.	The cassiterite occurs in quartz-hematite, breccias and quartz veins which surround the granite of the area.
E of Pine Ck. at Wolfram Camp, Horseshoe Ck., and Mt Todd.	The tin occurs in crush zones in chloritic schists, in quartz lodes and in alluvial deposits.
West Arm-Finnis R. area, extending from 35 m. S of Darwin.	Tin occurs in pegmatites in alluvial deposits.
Barrow Ck., 150 m. N of Alice Springs and Anningee field 50 m. W of Barrow Ck.	Tin has been mined.
Tungsten	
Hatches Ck. field, 300 m. by road NNE of Alice Springs.	Quartz reefs in quartzite, sandstone, greywacke, and acid porphyry.

NORTHERN TERRITORY

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Wauchope Wolfram field, 7 m. E of Wauchope Well on the Stuart Hwy, 260 m. N of Alice Springs.	The principal mineral is wolframite. Molybdenum, lead, tin, gold and iron are associated with the wolframite.
The following locations have produced important amounts of tungsten: Mosquito Ck., 30 m. NE of Wauchope.	Wolfram in patches some large, and ore shoots in quartz veins. The quartz reefs are in sericite-quartz-tourmaline hornfels. Small amounts of scheelite is associated with the wolfram.
Mt Doreen, 250 m. NW of Alice Springs.	Scheelite and disseminated wolfram in the quartz veins.
Wolfram Hill, 28 m. ESE of Pine Ck.; Yen berrie, 23 m. SE of Pine Ck.	Wolfram in pegmatites quartz and micaceous seams.
Yeuralba, 36 m. NNE of Maranboy Siding.	Wolfram as ore shoots in a quartz reef.
Small amounts of wolfram have been produced from: Agicondi Field (Edith R. and Mountain View); Arunta Field (Brooks Soak, Conniston Delni, Mt Dennison and Yuendunu); Granites Field; (Barrow Ck. and Mt Singleton); Kurrundi Field (Elkedra, Stirling and Woodenjer); McArthur Field (Pandanus Ck.); Waggaman Field (Walkers Ck.).	Ore bodies of wolfram-bismuth-scheelite and wolfram-cassiterite.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Antimony	
Wiluna, abt 370 m. ENE of Geraldton.	The antimony is associated with gold.
Blue Spec mine, 16 m. ENE of Nullagine on the Pilbara goldfield.	Slate, sandstone and quartzite are traversed by a strong shear zone of shearing up to 40 ft. wide, and more than 8 m. long. Mineralization is centred at several places along this shear. In the Blue Spec mine, the shear is 40 ft. wide and vertical. Gold is present over most of the width, quartz and antimony form irregular distributed lenses.
Pilbara goldfield.	Produced small quantities of antimony.
Asbestos	
Hamersley Ranges.	Numerous deposits occur exposed in walls of gorges as horizontal or near horizontal beds—the surrounding rocks are cherts and quartzites.
Main localities: Wittenoom Gorge, 17 m. by road SW of Mulga Downs Station and nearby Colonial Gorge.	Extensive deposits of asbestos have been reported.
Bee Gorge, 2½ m. W of Colonial Gorge.	Extensive deposits of asbestos have been reported.
Yampire Gorge, 30 m. SE of Mulga Downs.	Extensive deposits of asbestos have been reported.
Dale's Gorge, 9 m. E of Yampire Gorge.	Extensive deposits of asbestos have been reported.
Deposits have been reported in low hills S of Marra Mamba homestead, 65 m. W of Wittenoom Gorge.	
Lionel, 60 m. SE of Marble Bar.	Closely spaced chrysotile veins form lodes up to 6 ft. wide.
Nunyerrie, 60 m. SE of Roebourne.	
Sherlock, 35 m. ESE of Roebourne.	
Strelley, 28 m. N of Soansville.	Deposits worked near Nowrong Well, and at a locality 2 m. N of Bindi Bindi.
Bindi Bindi, 138 m. NE of Perth.	
Goomalling, 76 m. NE of Perth.	
Mt Magnet, 200 m. ENE of Geraldton.	
Deposit occurs 25 m. E of Moora, which is 92 m. W of Perth.	
Bulong, 20 m. E of Kalgoorlie.	Fibrous actinolite occurs in serpentine.
Yerilla, 90 m. NNE of Kalgoorlie.	
Goonagrrie, 50 m. NNW from Kalgoorlie.	
Meilga Station, 120 m. SE of Onslow.	Chrysotile deposits occur in dolomite adjoining a dolerite dyke.
Barite	
Cranbrook, 50 m. N of Albany.	The barite is pure and high grade and of two types—one coarse-grained and translucent; the other, fine-grained and opaque.
Cardup, 20 m. SSE of Perth.	A vein of barite, from 1 ft. to 4 ft., occurs in slate 50 ft. from a granite contact. The veins in places consists almost entirely of barite, in others of a fine granular mixture of quartz and barite.
Breen's Camp, abt 24 m. NNW of Marble Bar.	
Surprise Mine at Geraldine, 12 m. NNE of Ajana.	The lode occurs in a shear in granite gneiss and serpentine.
Chesterfield area, abt 50 m. NW of Meekatharra.	
Northampton district, 30 m. S of Ajana.	The gangue of the lead deposits contains massive colourless and milk-white barite. All the barite occurs in garnetiferous granite.
Holden's Find, 60 m. N of Meekatharra.	Barite is present in a lode 450 ft. long and at least 4 ft. wide.
Bauxite	
Darling Ranges, abt 20 m. inland from and parallel to the southern part of the west coast.	The bauxite deposits have been found over an area 200 m. long and 25 m. wide in the Darling

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
(The bauxite is mined at Jarrahdale, 30 m. SSE of Perth.)	Ranges. The bauxite occurs in numerous separate beds, the average thickness of the ore is 10½ ft., and the average overburden 2½ ft. thick.
Beryl	
Pilbara district:	
Tabba Tabba, 40 m. SE of Port Hedland.	Narrow bands at junction of quartz and feldspathic material in large pegmatite dyke.
Wodinga, 60 m. S of Port Hedland.	Caesium bearing beryl in large masses in pegmatite dyke recovered as a by-product of tantalum mining.
Yinnietharra Station, 160 m. E of Carnarvon on the Gascoyne R.	Distributed sporadically through pegmatite dykes and alluvial material.
Londonderry, 13 m. SSW of Coolgardie.	In feldspar quarries on a large pegmatite dyke.
Bismuth	
Morrissey Hill and Nardoo Ck., 10 m. N and 15 m. NW respectively of Yinnietharra Homestead, 150 m. E of Carnarvon.	Deposits are small and patchy.
Melville, 10 m. N of Yalgoo.	Bismuth is associated with scheelite and lead minerals in a network of quartz veins and pegmatite dykes traversing greenstone.
Cobalt	
chief ore minerals of cobalt are smaltite, cobaltite, erythrite and asbolite.	
Hamersley Gorge in the Eyre Ranges, 35 m. S of Ravensthorpe.	A shoot of ore 6 ft. long and 2 to 8 in. wide contain 3·1 percent cobalt.
Alice Mary copper mine near Kundip.	Cobaltite and erythrite are reported to have been obtained from the 70 ft. level.
Whim Ck. in the W Pilbara goldfield.	Cobalt minerals occur.
Kanowna in the N Coolgardie goldfield.	Asbolite is reported to be plentiful in the deep leads.
Copper	
West Pilbara goldfield—Whim Ck. copper deposits, 60 m. SW of Port Hedland.	The lode outcrops along the crest of a hill for a distance of 2700 ft., and ranges in width up to 40 ft., with an average of 12 ft. Slate, impregnated with copper minerals, is interbedded with fissile clay, slate and talcose schist.
Croydon area, 25 m. SE of Whim Ck.	Small lodes occurred, but have been worked out.
Mt Margaret goldfield—Eulaminna, 30 m. E of Leonora.	Three major ore bodies occur at the junction between lavas and sedimentary rocks, over a length of 1300 ft. Gold and silver also present in the ore.
Phillips R. goldfield—in the SE part of the State.	The deposits occur in lavas. Economic mineralization is mainly restricted to shear zones which lie at or within 1 m. of the edge of an intrusive granite.
Corundum	
Abydos Station, 22 m. SE of Wodgina, inland from Port Hedland.	Detrital corundum scattered over about an acre near the station.
Dangin and Cubbine, 120 m. E of Perth on the York to Bruce Rock rlwy line.	Detrital and *in situ* deposits.
Gibraltar, 20 m. SW of Coolgardie.	Detrital deposits and boulders up to 50 lb. in weight.
Kathleen Valley, 65 m. SSE of Wiluna in the E Murchison goldfield.	Massive granular corundum as lenticular masses in greenstone schist.
Richenda R., 5 m. S of Mt Broome, 120 m. E of Derby.	
Diamonds	
Pilbara goldfield, Nullagine district.	Nullagine conglomerate which is a well-cemented proterozoic rock. The conglomerate is widely distributed and the incidence of diamonds within it is small.
Garnet	
Rothsay, 135 m. ESE of Geraldton.	A highly garnetiferous band, 12 ft. wide con-

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	taining 50 to 90 percent andradite in pre-cambrian greenstones.
Yinnietharra, 160 m. ENE of Carnarvon.	Almandite in pre-cambrian granitic gneiss.
Northampton, 26 m. N of Geraldton.	Almandite in pre-cambrian granitic gneiss.
Nornalup, 60 m. W of Albany.	Almandite in pre-cambrian granitic gneiss.
Yabberup, 25 m. SE of Bunbury.	Almandite, pyrope and grossularite in chloritic hornblende-schist.

Gold

There are five auriferous belts in Western Australia, the first of which runs nearly N and S about 200–250 m. from the coast in the southern portion of the State, and it is on this belt that Yilgarn and the Murchison goldfields are situated. The Coolgardie belt, about 100 m. E and parallel to the Yilgarn belt, extends from the Dundas Hills through Coolgardie, Ularring, to the east of the Murchison. On the Ashburton the belt runs NW and SE, but is probably the extension of the Yilgarn belt, which ends at the head of this river. The Roebourne belt strikes E and W along the NW coast from the Nicol R. to the DeGrey R., disappearing beneath the sandy tableland to the east. The Kimberley belt strikes in a NE and SW direction, and is very probably the extension of the Roebourne belt, re-appearing on the NE side of the sandy tableland. These belts carry gold for a great length; the reefs generally are of great size, very rich, and wherever they have been tested they have proved to be good. A large quantity of stone has been crushed from the different fields, which has averaged 1 oz. to the ton of stone, whilst alluvial patches of great value are still being worked.

Alluvial gold has been found on all the goldfields of Western Australia, on or near the surface, clearly shed from quartzore and ironstone veins and lodes containing gold. In the residual deposits the gold ranges from mere specks to pieces weighing hundreds of ounces. At Sharks Gully (Pilbara Goldfield) a nugget was unearthed containing 413·37 oz. of gold, of which 76·8 percent was fine gold, 23·1 percent fine silver and 0·15 percent copper. The largest known piece, found 50 m. S of Coolgardie, contained 947 oz. of fine gold.

Coolgardie.	Gold extracted from loose, dry surface alluvials. Surface layer of granite varies from a few inches to several hundred feet. Locally covered by cemented detrites up to 3 ft. thick, some being auriferous. Deposits usually patchy and frequently lie at head of shallow gullies starting from ridges where a quartz vein outcrops. Gold may be traced up to the outcrop which yielded it, or may be scattered in the sand for half a mile. Rich and workable deposits will be found 30 or 40 ft. from the reef.
The Coolgardie Goldfield.	Alluvial leads—consist of level-bedded friable sandstone, but mostly sandgrains and quartz fragments embedded in kaolin. Maximum thickness of deposit is 15 ft. and the width from 90–100 ft. and the lead follows a serpentine course for 1½ m. Usually a bed of iron-stone gravel rests on the cemented material and fills gutters and potholes in it or is mixed with the kaolin. Payable gold found exclusively in the cement.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	Most gold won from the quartz-wash, but overlying kaolin and ironstone gravel and superficial deposits also auriferous.
Kurnalpi District—E of the NE Coolgardie field.	Noted for extensive alluvial leads and for the size of the nuggests obtained from them, largest containing 215 oz. of gold.
Typical deep-lead system Kanowna (near Kalgoorlie), at the North, with its branches the Cemetery, Fitzroy, Wilson's, Moonlight and probably the Q.E.D.	Width of the old channel varies from 2–80 ft., averaging about 10 ft. Gradient at the rate of 40 ft. to the mile with deposits ranging up to 90 ft. thick. Alluvial material varies but in general the auriferous pebbly wash, locally cemented by secondary silica into kind of quartzite, is overlaid by a variable thickness of kaolin and then by layers of ironstone gravel and quartz pebbles partially cemented by kaolin and iron oxides. Whole area covered with unconsolidated Recent waste or alluvium.
Graphite	
Donnelly R., 15 m. W of Manjimup.	15 m. W of Manjimup, a series of micaceous schists with bands of graphite schist is covered by gravel and yellow clay.
Munglinup R., 70 m. W of Esperance.	Graphite seams up to 22 ft. thick occur in zones of graphite schist, which form part of a folded and metamorphosed belt.
Young R., 12 m. NE of the Munglinup R. deposits.	A band of graphitic schist, consisting mainly of graphite and feldspar; with a thickness of at least 10 ft., has been exposed in the river bank.
Kendenup, 51 m. by rail NNW of Albany.	Graphite reported.
Pallinup R., 75 m. NE of Albany.	Graphite reported.
Martagallup, Katanning and Frankland R., (90 m. SE of Bridgetown).	Graphite reported.
Northampton, 35 m. N of Geraldton.	Graphite occurs in granulites, in pegmatite dykes, in concentrations with lead and copper lodes, and in ferruginous laterites.
Gypsum	
Dooka, 7 m. S of Dongara; Cliff Head, 20 m. S of Dongara.	These are solid bodies of crystaline gypsum.
Boologoora consists of three areas: the southernmost starts at the 35 m. post on the Carnarvon-Onslow telegraph line and extends along the line to the 47 m. post, are situated approx. 50 m. N of Carnarvon.	The deposits consist essentially of hard-bedded coarsely-crystaline gypsum.
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Heavy minerals occur on many of the beaches of the SW of the State. These are similar to and formed under the same conditions as those of Queensland. Ilmenite is usually the predominant mineral.	
Capel–Ludlow, midway between Bunbury and Busselton.	These deposits are in old beach dunes 3 m. from the present coastline and down to a depth 20 ft. The deposit stretch over a length of 14½ m. and are ½ m. wide. The deposits are broken by the Capel, Ludlow and Abba Rs. The concentration of heavy minerals varies from 10 percent at the southern end of the deposit to 80 percent at the northern end.
Koombana Bay, near Bunbury.	Heavy mineral sands occur on the present beaches, fossil beaches, and dunes. The heaviest concentrations are on the fossil beaches.
Yogunup–Tutunup, 15 m. E of Busselton.	The deposits occur on the lower part of Whicher Scarp overlain by pisolitic laterite or sand. The heaviest minerals occur in lateritized ferruginous sandstone and also lower down the

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	slope in clay and clayey sand to a depth of 35 ft.
Gabanintha, 25 m. SSE of Meekatharra.	Titaniferous iron ore deposits occur near Gananintha.
Beach deposits are also reported from the many places on the S and W coasts of the SW of the State.	
Other deposits are known at: Broome; Dampier Peninsula; Geraldton; and inland, from Lake Dumbleyung near Wagin.	
Iron	
Yampi Sound deposits, 85 m. N of Derby. The northern boundary of the Sound is a line of islands; Cockatoo I., Koolan I., and Irvine I., contain iron ore.	The islands consist of bedded quartzite, schist, and hematite. The hematite content of the rocks is low except in the orebodies.
Koolyanobbing deposits are situated 35 m. SE of Southern Cross.	Four lenses of high-grade ore occur over a distance of 3 m. along the crest of the Koolyanobbing Hills and Dowd's Hill, forms a prominent hill 4 m. to the NW. At the surface the ore consists of massive or banded limonite, with minor amounts of magnetite or siderite.
Bungalbin deposits, situated abt 40 m. N and NW of Koolyanobbing.	At the surface the iron mineral is mainly limonite and some hematite, with a small amount of magnetite.
Tallering Peak, 75 m. NE of Geraldton.	A formation of Jaspilite contains lenses of hematite.
Mt Goldsworthy in the Ellerine Hills, 70 m. E of Port Hedland.	Several lenses of hematite outcrop near Mt Goldsworthy. It forms a ridge rising to about 200 ft. above the general plain.
Scott R. deposit is situated 11 m. NE of Cape Leeuwin and about 4 m. E of the mouth of the Scott R.	Laterite extends over an area of 2 sq. m.
Hamersley and Ophthalmia Ranges in the Pilbara region of NW Western Australia.	The deposits containing the greatest reserves consist of pisolitic goethite and limonite admixed with hematite, capping mesas and as terrace deposits along the Robe R., Duck Ck. and the Turner R. systems. Other deposits of hematite-goethite ore admixed with limonite occur in the Ophthalmia R., especially near Mt Newman and Weeli Wolli Spring.
Pompeys Pillar, about 60 m. S of Wyndham.	High-grade iron ore occurs.
Port Hedland and at Ord Range (40 m. E of), Strelley (60 m. SSE of), Gorge and Yarrie (110 m. ESE) of Port Hedland; Mt Gould and Mt Hale, abt 110 m. NW, Weld Range, 65 m. SW, and Joyner's Find, 110 m. E of Meekatharra.	High-grade iron ore occurs.
Koolanooka Hills, 25 m. E of Mt Gibson 75 m. ESE of Morowa.	High-grade iron occurs.
Pigeon Rocks, Windarling and Mt Jackson, all in the area 70 to 100 m. N of Southern Cross.	High-grade iron ore occurs.
Mayfield, 55 m. NNW of Southern Cross.	High-grade iron ore occurs.
Lead and Zinc	
Northampton Field 35 m. N of Geraldton (silver-lead-zinc).	Lodes occupying tension fractures associated with basic dykes. Local rocks are garnet, granulite and quartzite sheared and intruded by dolerite and epidiorite dykes. Most of the lodes are several hundreds of feet long and up to 30 ft. wide.
Lead has been mined from the following locations: Andover Mine, 7 m. S of Roebourne; Braeside, 90 m. E of Marble Bar; Coongan Siding, 90 m. from Port Hedland, on the Old Marble Bar Rlwy.; Kimberley goldfield; Kooline, 115 m. SE of Onslow; Mundijong,	

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
25 m. S of Perth; Narlarla, 75 m. E of Derby; Peak Hill goldfield; Uaroo, 80 m. S of Onslow; Whim Ck., 45 m. E of Roebourne; Wyloo, 100 m. SE of Onslow.	
Zinc contents were recorded in lead ore and concentrates from the Northampton, Pilbara and West Kimberley fields.	
Manganese	
Pilbara area: Ripon Hills; Mt Sydney; Woodie Woodie; Skull Springs; Bee Hill; Sunday Hill; Mt Cooke; Mt Fraser Station and at Nimingarra, 50 m. N of Marble Bar.	The deposits occur as thin cappings, blocky or pisolitic deposits, fissure and cave fillings or as sedimentary manganiferous beds.
Peak Hill area: Horseshoe area, 80 m. N of Meekatharra.	A flat-lying deposit rests in a floor of vertically dipping Precambrian phyllite and sandstone.
Mudderwearie deposits, 5 m. WNW of Peak Hill.	Deposits small and shallow.
Raventhorpe district: Naendip deposits, abt 50 m. SW of Raventhorpe.	Manganese associated with Precambrian mica schist, slate, dolomite and jaspilitic rocks.
Coppermine Ck., 51 m. by road SW of Raventhorpe.	Manganiferous beds 5–20 ft. thick alternate with beds of barren schist, all dipping steeply.
Other deposits occur at Mt Decker and Mt Chester in the Raventhorpe Range.	Manganese deposits occur.
Hamersley R., 23 m. SSW of Raventhorpe; Bremer Range, abt 50 m. SW of Norsman; Mt Walton, 90 m. WNW of Kalgoorlie; Teninde wa, 56 m. E of Geraldton; Mt Lucky, 12 m. SSE of Laverton.	
Mica	
Yinnietharra and Bidgemia stations, abt 160 m. E of Carnarvon.	The deposits occur N of the Gascoyne R. in a belt of country about 50 m. long and up to 15 m. wide, extending between the Pyramid and Mt James to the SE of the station homestead.
Morrissey Hill, 9 m. N of Yinnietharra Homestead.	Muscovite occurs in pegmatite dykes. The pegmatites range up to 600 ft. in length and over 100 ft. in width. Biotite, tourmaline, garnet, beryl, columbite, and bismuth minerals are associated with the mica.
Mullalyup, 41 m. by rail SE of Bunbury.	Several coarse grained pegmatites containing muscovite occur in schist and gneiss.
Napier Downs Station, 75 m. E of Derby.	Clear and wine coloured mica, occur over a width of 15 ft., and sheets up to 36 sq. in. have been obtained.
4 m. E of Ajana, 66 m. N of Geraldton.	The deposit contains books of clear ruby-muscovite, which would yield unflawed sheets up to 6 sq. in.
Mullinyu and Kianooka Hill in the Northampton district, abt 30 m. N of Geraldton.	Mica has been reported.
Globe Hill and Mt Alexander, 65 m. and 75 m. SSE of Onslow.	
Jimperding, abt 10 m. N of Northam.	
Collie, in the SW of W.A.	
Kirup and Mumballup, 30 m. SE and 32 m. ESE of Bunbury.	
Londonderry, 13 m. SSW of Coolgardie.	
Simon's Hill, 75 m. ENE of Norseman.	
Cape Pasley, 95 m. E of Esperance.	
3 m. N of the Bellinger Sand Patch, near Cape Pasley.	
Mica Hill, 25 m. N of Cape Pasley.	
Young R., 76 m. by road from Esperance.	The vermiculite occurs in loosely coherent wedge-shaped masses.
Bulong, 20 m. E of Kalgoorlie.	Vermiculite occurs in serpentine in a greenstone complex.
Mt Palmer, 7 m. S of Yellowdine in the Yilgarn goldfield.	

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Molybdenite	
Mt Mulgine, 56 m. SSW of Yalgoo.	Molybdenite associated with pyrite forms thin seams along the margins of pegmatite quartz veins, and occurs as scattered flakes in the enclosing granite.
Dandalup, approx. 50 m. S of Perth, and 5 m. SW of Greenbushes, which is 42 m. SE of Bunbury.	
Nickel	
South Australian border, Kunanalling; abt 25 m. NW of Kalgoorlie.	Nickel is known to occur in laterite deposits.
Widgie, 58 m. N of Norseman.	Nickel is reported and reserves tested.
Darkin and Lunon, approx. 60m. NE of Norseman; Neapean, NW of Yilmia rlwy stn., which is on the Norseman–Coolgardie line; Scotia, 40 m. N of Kalgoorlie; Carr Boyd Rocks, 30 m. NE of Kalgoorlie; Mt Windarra, 80 m. NE of Leonora; Mt Keith, 120 m. NW of Leonora.	
Golden Ridge, 19 m. SE of Kalgoorlie.	Diamond drilling indicated low grade grade nickel and copper mineralization.
Deposit occurs near Pinnacles Homestead, S of Agnew and 80 m. NW of Leonora.	Nickel reported.
Lake Barlee, 96 m. W of Leonora.	Traces of nickel reported.
Wiluna, 194 m. NW of Leonora.	Nickel reported.
Cane Grass, NW of Scotia, which is 40 m. N of Kalgoorlie.	Nickel reported.
Blackstone, 900 m. NE of Perth and 40 m. W of the South Australian border.	
Mt Pleasant, near Broad Arrow, 24 m. N of Kalgoorlie.	Sulphides reported.
Quartz Crystal	
Oak's Park near Goomalling.	Crystals found in the soil.
Morowa Hightman's homestead.	In weathered rock.
Payne's Find, 86 m. SE of Yalgoo.	In pegmatites.
Kangan Station, 54 m. S of Port Hedland.	In clay in pegmatite dykes.
Kalgoorlie.	Found occasionally during gold mining operations.
Silver	
Dundas, East Coolgardie, Mt Margaret, Murchison and Yilgarn goldfields.	Silver recovered from gold ores during refining.
Donnybrook.	Electrum reported.
Yundamindera.	Electrum reported.
Kalgoorlie.	Cerargyrite, hessite, naumannite and sylvanite reported in association with gold ores.
Menzies.	Cerargyrite in association with gold ores.
North Pole, W of Marble Bar.	Cerargyrite in association with gold ores.
North Shaw W of Marble Bar.	Proustite and sylvanite in association with gold ores.
Red Hill, 35 m. SE of Coolgardie.	Cerargyrite in association with gold ores.
Silver lead ores have been reported from: Braeside, 90 m. E of Marble Bar; Bulloo Downs, 120 m. NNE of Peak Hill; Kooline, 115 m. SE of Onslow; Mt Amherst, 45 m. W of Halls Ck.; Narlarla, 75 m. E of Derby; Northampton, 35 m. N of Geraldton; Uaroo, 80 m. S of Onslow; Woolcocks, 7 m. S of Roebourne; Wyloo, 100 m. SE of Onslow.	
Silver has been produced from copper lodes at: Ravensthorpe in the SW of W.A.; Whim Ck. near Onslow.	
Tin	
chief ore mineral of tin is cassiterite.	
Greenbushes, 44 m. by rail SSE of Bunbury.	Most of the cassiterite in this area occurs in alluvial deposits.
Smithfield, 19 m. SW of Greenbushes.	Alluvial tin and tin bearing pegmatites occur.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Moolyella field, about 10 m. E of Marble Bar.	The tin occurs in granite in pegmatite dykes which traverse the granite. Alluvial tin also occurs in the area.
Cooglegone tinfield, 43 m. SW of Marble Bar.	The cassiterite has been mined from shallow wash in creeks.
Coodardy and Poona, 20 and 35 m. respectively NW of Cue.	Tin has been reported.
Dyason's Ck. and the King's Sound tin mine, 130 m. E and 90 m. NE of Derby.	Tin has been reported.
Tungsten	
Edna May Mine; Westonia, 6 m. N of Carrabin on the Perth–Kalgoorlie rlwy.	Scheelite associated with and replacing wolfram is distributed through the wall rock adjoining an auriferous quartz ore body.
Callie Soak, 11 m. N of Big Bell on the Murchison goldfield.	Scheelite and wolfram in pegmatite quartz veins and sometimes in a quartz biotite rock adjoining the veins.
Higginsville, 38 m. N of Norseman on the Coolgardie Esperance rlwy.	Scheelite in thin stringers on the margins of a vertical auriferous quartz reef in actinolite amphibolite.
Small quantities of concentrates have been produced from the following locations: Comet Vale, 18 m. SSE of Menzies; Erlistown, 45 m. N of Laverton; Golden Pole Mine Davyhurst, 35 m. SW of Menies; Hassels near Mt Gilson, 55 m. NE of Wubin on the Meekatharra rlwy; Mt Margaret goldfields; Napier Downs West Kimberley district; Neville's Prospect Noongal, 16 m. NNE of Yalgoo; Norseman, 45 m. N of Laverton; Ora Banda, 35 m. NW of Kalgoorlie; Pilbara goldfield; Yalgoo goldfield.	In dumps. As scheelite. Wolfram. Wolfram.

▲ Iron Ore Rocks B.H.P.

▼ Mica Crystals

▲ Pyrite Crystals

▼ Sphalerite B.H.P.

SOUTH AUSTRALIA

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Antimony	
No antimony deposits of economic importance are known to occur in South Australia.	
Asbestos	
Robertstown, 70 m. NNE of Adelaide.	The deposits occur as veins in fractured and highly metamorphosed marbles.
Flinders Ranges—Deposit occurs 4 m. S of Oraparinng homestead, 18 m. S of Blinman.	
Arkaba, 10 m. NNE of Hawker.	
Shaggy Ridge, 25 m. ENE of Hawker.	
Umberatana, 70 m. by road NE of Copley.	
Mt Lyndhurst E of Lyndhurst rlwy stn. on the Alice Springs line.	
Truro, 30 m. N of Robertstown.	
Deposit occurs 3 m. NW of Cowell on the E side of Eyre Peninsula.	Chrysolite forms cross-fibre veins up to 1½ in. wide, along narrow steeply-dipping shear zones in highly altered serpentized and talcose marble.
Oodla Wirra, 20 m. ENE of Peterborough.	
Barite	
Flinders Ranges—Oraparinna deposits, 66 m. NNE of Hawker.	Lodes occur as steeply dipping veins in fractures in slate. The barite is a suitable grade for marketing.
Mt Chambers, 40 m. NE of Oraparinna.	The lode ranges from 2½ to 6 ft. in width and is about 200 ft. in length.
Bunbingunna in Section 16, Hundred of Moralana, which is situated between Elder's Range and Wilpena Pound Range abt 20 m. N of Hawker.	Hematite.
Other places in the Flinders Ranges: Beltana (Mt James, Puttapa Gap, Moolooloo, New Springs and Nilpena); Carey Hill and Mt Frome.	
Mt Lofty Ranges—Noarlunga, 24 m. S of Adelaide	The main lodes are confined to an area of about ½ m. long and ½ m. wide. The barite occurs in irregular lenses which are connected as thin veins.
Truro, 45 m. NE of Adelaide.	
Barite has been obtained from several places in the Mt Lofty Ranges: E of Adelaide, Mt Barite Mine; 2½ NE of Birdwood.	
Olary district—A deposit 7 m. NE of Weekeroo homestead (14 m. WNW of Olary).	Consists of eight main bodies.
Mt Mulga, 3 m. SE of Old Boolcoomata homestead, which is 15 m. N of Olary.	
Dome Rock, 29 m. NNE of Olary.	The largest of several outcrops is a lens 200 ft. long and about 100 ft. wide. It has a high percentage of impurities.
Meningie Well, 14 m. NNE of Olary.	
Bauxite	
No bauxite deposits are known in South Australia. Ferruginous laterite occurs rather sparsely, but no aluminous varieties have been reported.	
Beryl	
Olary district—Old Boolcoomata area, 25 m. NE of Olary.	In pegmatites.
Bimbowrie area, 20 m. NNW of Olary.	
Granite Downs Station in the Everard Ranges.	Abundant in pegmatites.
Gumeracha, 16 m. ENE of Adelaide.	Accessory mineral in feldspar deposits.
Bismuth	
Balhannah mine, 14 m. ESE from Adelaide.	The lode occupies a fissure in slates, it has a length of 250 ft., ranges in width from a few inches to 15 ft. Patches of chalcopyrite and bismuth occur in the lode.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Golden Ridge Mine; Second Valley, 50 m. S of Adelaide; Stockyard Gully, 20 m. NE of Adelaide; Forest Range in the Mt Lofty Ranges, E of Adelaide; Mt Mac Donnell, 7 m. E of Yudnamutana, in the northern Flinders Ranges; Mannahill goldfield and Teetulpa goldfield respectively 40 and 60 m. W of Olary; Murninnie, near Spencer's Gulf, 64 m. S of Port Augusta; Tumby Bay in the SW part of Spencer's Gulf.	Bismuth associated with gold in mines.

Chromite

No chromite deposits of economic importance have been found in South Australia, but chrome and nickel mineralization has been reported from Tomkinson Ranges.

Cobalt

chief ore minerals of cobalt are, smaltite, cobaltite, erythrite, and asbolite.

Bimbowrie, 19 m. NNW of Olary.	Where smaltite, cobaltite, erythrite occur disseminated through marble cut by granite dykes, and as thin seams conforming with the bedding of the marble.
Ethiudna Hill, 38 m. NW of Olary.	Small low-grade cobalt-copper lodes occur.
Mt Howden cobalt mine, 25 m. ENE of Ethiudna Hill.	Small low-grade cobalt-copper lodes occur.
Mt Ogilvie, 23 m. NE of Copley near Leigh Ck.	Small low-grade cobalt-copper lodes occur.

Copper

Moonta and Wallaroo copper-mining district on the E shore of Spencer Gulf.	The copper content in the early days averaged about 30 percent but declined progressively until 1918 when it was only averaging 4 percent.
Mt Lofty Ranges—Burra Burra Mine, abt 100 m. N of Adelaide.	Discovered in 1845 and worked until 1877 when the rich ore was exhausted.
Kapunda Mine, 47 m. NE of Adelaide.	The ore occurs in veins in a series of fractures in friable sandstone and slate.
Callington-Kanmantoo Copper Mine, 30 m. SE of Adelaide.	The copper deposits occur as numerous small pipes and tabular veins in the metamorphosed rocks, which were intruded by numerous small pegmatite veins.
Flinders Ranges—Blinman copper mine, 125 m. NE of Port Augusta.	
Sliding Rock copper mine, 14 m. ENE of Beltana.	Small rich bodies containing 80 to 90 percent native copper were discovered in the early years, but in later years the average dropped to 3 to 4 percent copper.
The Mt Gunson–Pernalty Lagoon copper and manganese deposits occur along the western margin of Pernalty Lagoon, abt 90 m. NW of Port Augusta.	The copper deposits consist of flat, irregularly-tabular ore bodies in flat-lying ferruginous sandstone adjacent to underlying dolomite.
Small copper prospects occur in the Olary district (Mutooroo Mine, 12 m. N of Cockburn); Dome Rock copper mine, 26 m. north of Mingary on the Broken Hill rlwy line; copper has also been won from the Peake and Denison Ranges, between Lake Eyre and Alice Springs.	

Corundum

4 m. W of Mt Painter, 60 m. ENE of Leigh Ck.	Abundant in micaceous schists.
Mt Crawford, near Williamstown, 25 m. NE of Adelaide.	

Diamonds

Echunga goldfield.	In gold drifts.

Gold

Alluvial gold has been won from several fields, mostly the result of natural concentration from small veins and leaders. Among the most important fields were Echunga, Teetulpa, Barossa and Ulooloo. In a number of the fields the gold was found not merely in the alluvium of existing creeks but also in old alluvial deposits of Tertiary age. These are often characterized by a hard, ferruginous sandstone and conglomerate capping or cement. Exceptionally some of the Barossa leads yielded as much as 9 oz. of gold to the tub. Several small nuggests were un-

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
earthed, one of the largest, from Teetulpa, being nearly 30 oz. None of the Tertiary leads is basalt-covered.	
Echunga Goldfield—At Chapel, Windlass, Poor Man's, Little Bendigo Hills, Chapman's, Break of Day, Diamond, Donkey, German, Hahndorf, Little Bendigo, Long, Sailor's, Sawmill and Simond's Gullies; Wattle Flat, Bell's Point, Christmas Rush and Hough's Paddock.	In alluvium.
Onkaparinga River—At Bigg's Flat, Pennyweight Flat, Seaman's Point, Black Sand Corner, Hack's Bridge, etc.	
Teetulpa Goldfield—At Brady's, Brennan's, Flack's, Goslin's, Strawbridge's, Dam and other gullies.	In alluvium.
Barossa Goldfield—At Cottiers', Edwards', Goddard's, Green, Hitches', Red and Victoria Hills, Melville's Rush, Simmons', White Leads, Bismarck's, Simms' Paddock and at Yetti Hill.	In Tertiary gold drifts and deep leads.
At Bullocky, Devil's, Gollop's, Green Hill, Hamlin's, Hissey's Mary's, Moonta, Nuggetty, Spike, Vixen Gullies and at South Para R.	In alluvium.
Ulooloo Goldfield—At Coghlin's and Scrubber's Camp Creeks and White Lead.	
Jupiter Creek Diggings—At Dead Horse, White, and Foster's Gullies, Surface and Golden Points.	In alluvium.
Mount Crawford and Gumeracha, Hundred of Para Wirra—At Avenue, Baynes', Dead Horse, B. and T. Tales, Kerosene, Sailors', Snake, Speck, Spring and Watts' Gullies and near Kersbrook.	In alluvium.
King's Bluff—At Mellor's Gully, about 4 m. from Olary rlwy stn.	
Booleroo Springs—12 m. NW of Leigh's Ck. rlwy stn.	In alluvium.
Billy's Springs—Near Mt Fitton, NE of the main range.	In alluvium.
Yudnamutana—About 60 m. E of Farina.	
Twigham—About 2 m. E of the Ulooloo Diggings.	
Rieschbeith's Well—In the Mt Nor'-West Ranges, about 50 m. W of Hergott Springs.	
Algebuckina or Peake Diggings—On the Neales R. NW of Lake Eyre.	
Mintaro—Near the township.	
Mount Ogilvie—Near Tower Gap, Mt Lyndhurst Run.	
Angepena—At Waukaringa, Wadnaminga, Mannahill Reefs, Giles's Nob, Noarlunga, Kangaroo I., Callawonga and Station Cks. (Waitpinga) Cuttaway Hills, Leigh's Ck., at the Peake, Denison and Mount Dutton Ranges.	Alluvial gold worked to a limited extent.
At Clarendon, Currency Ck., Macclesfield, in the Port Lincoln and Franklin Harbor Districts, Hundred of Coglin (near bore), Quartzose Peake (Mt Lyndhurst Run), Tennant's Ck. (N.T.) and Lincoln Crossing (near Port Augusta).	Gold reported to have been discovered.
Graphite	
Uley graphite mine, 14 m. SW of Port Lincoln.	The graphite deposit is irregular in shape, with poorly defined walls, and has a proved length of about 210 ft. Both the graphite schist and the country rock are soft and highly weathered.
Koppio graphite mine, 28 m. N of Port Lincoln.	The bed of graphite schist can be traced discontinuously S for 5 m.; it underlies a sequence of hematite and schist.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Gypsum	
Lake MacDonnell, abt 8 m. N of Penong.	The largest known deposit of gypsum in the Commonwealth adjoins Lake MacDonnell. The deposit consists of high-grade material chiefly rock gypsum containing less than 0·2 percent insoluble material and more than 94 percent gypsum.
10 m. SSE of Streaky Bay in the Eyre Peninsula.	Economic deposits of gypsum occur.
Moonabie, nr Mt Middleback, 28 m. WSW of Whyalla	Economic deposits of gypsum occur.
Stenhouse Bay, between Cape Spencer and Marion Bay.	Rock gypsum forms the beds of several lakes occupying an extensive swamp area either side of the bay.
Lake Bumbunga, abt 25 m. N of Port Wakefield at the head of St Vincents Gulf.	Impure gypsum occurs in a ridge tending NW parallel to the shore of the lake.
Cookes Plain, 10 m. SE of Tailem Bend.	Gypsum occurs as dunes up to 40 ft. high.
Craigie Plain, deposit is a low-lying swampy area on the margin of the Murray R. plains midway between Truro and Blanchetown, about 80 m. from Adelaide.	Gypsum occurs.
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Williamstown, 25 m. NE of Adelaide.	Rutile as small veins in mica schist and as a by-product of china clay mining.
Mt Jagged, 34 m. S of Adelaide.	Titanium minerals ilmenite, rutile and titaniferous iron ore.
Radium Hill, 19 m. ESE of Olary.	Titanium minerals are common in the uranium ore of this location, rutile and ilmenite being the principal metallic minerals. They are not recovered during the uranium mining process.
Yankilla, 40 m. S of Adelaide.	Lenses of rutile in a body of mica schist associated with pegmatite.
Iron	
Principal sources of iron are oxides of hematite, magnetite, goethite and limonite.	
Most important deposits are those of the Middle Back Ranges, situated in the NE part of Eyre Peninsula.	There are twelve deposits of bedded hematite. From N to S, they are Iron Monarch, Iron Prince, Iron Baron, Iron Knight, Iron Duchess and Iron Duke ore bodies. The ore in all cases is predominantly hematite.
Cutana, 10 m. S of Mingary; Donnelly's Comstock, near Quorn; Oodlawirra, 60 m. NE of Port Pirie; Mt Bessemer, nr Williamstown; and Peeralilla, 7 m. N of Victor Harbour.	Iron ore was mined from these deposits.
Mt Christie, 30 m. N and NW of Malbooma on the Trans-Continental Railway; Wilgena Hill, 8 m. E of Tarcoola on the same rlwy and in the Olary area.	Iron deposits occur.
Lead and Zinc	
Glen Osmond district: Mt Lofty Ranges, Glen Osmond, 4 m. SE of Adelaide (lead).	Steeply dipping lodes containing galena and cerrusite in a gangue of iron oxide, carbonates and barite.
Other localities in the Mt Lofty Ranges: Callington, 30 m. ESE of Adelaide; Mt Malvern, 10 m. S of Adelaide; Strathhalbyn, 30 m. SSE of Adelaide; Rapid Bay including the Talisker Mine, 50 m. SSW of Adelaide; Riverton, 50 m. N of Adelaide; Robertstown, 70 m. NNE of Adelaide (lead). In Flinders Ranges lead occurs at: Avondale, 2 m. SW of Mt Lyndhurst Station; Baratta, 35m. E of Hawker; Duck Pond Hill, 90 m. NE of Farina; Ediacara, 18 m. W of Beltana; Ooloo Dam, 60 m. E by N of Farina; Eastern Eyre Peninsula; Cleve and Cowell (lead).	Siliceous lode formations in Archaean mica schist and quartzite and very occasionally in dolomite or gneiss.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Olary Province, in the E of the State, (lead).	Sparse grains of Galena in Hydrothermal quartz reefs associated with gold.
Commodore Mine, 30 m. SE of Olary.	Or:
Perse Verance Mine, 12 m. E of Olary.	As thin discontinuous seams associated with iron oxides and gold in dolomatic slates.
Mt Fitton Mine, 50 m. ENE of Mt Lyndhurst Station.	High grade lead-zinc-copper ore reported.
Manganese	
Carrieton District, 45 m. E of Port Augusta.	
South Australian Mine on Boolcunda Ck. nr. Willochra.	Four parallel lodes occur, one averaging 9 ft. in width, the others 2–5 ft. containing pyrolusite, manganite and psilomelane.
Manganese deposits were worked 9 m. E of Blinman in the Flinders Ranges, approx. 110 m. NNE of Port Augusta.	The deposits occur in basal Cambrian dolomitic limestone and slate.
Martin Well, 40 m. SE of Blinman.	A small deposit of manganese occurs.
Pernatty Lagoon, 70 m. NNW of Port Augusta.	The ore occurs on the western shore of the lake and the lake bed.
Mica	
Williamstown, 23 m. NE of Adelaide.	Mica occurs.
Molybdenite	
Yelta mine nr Moonta on Spencers Gulf, 70 m. S of Port Pirie.	Molybdenite occurs as bunches in copper ore.
Nickel	
Flinders Ranges	Cobalt and nickel have been recorded in association with copper.
Tomkinson Ranges in the NW corner of S.A. and the adjoining part of W.A.	A vast complex of basic and ultrabasic rocks outcrops over a length of 100 m. and width of up to 70 m. The exposures are in the form of ranges separated by broad alluvial flats. Nickel and copper sulphides and chromite in accessory amounts and small concentrations. Parts of the complex are overlain by nickelferous laterite.
Ethiudna Hill, abt 35 m. NW of Olary.	Veins containing copper and small amounts of cobalt and nickel occur.
Platinum	
Mingary, near the N.S.W. border on the Broken Hill rlwy.	Platinum has been reported.
Quartz Crystal	
King's Bluff, nr Olary.	Crystals found in gold workings.
Kirkeeks Treasure Gold Mine, 37 m. N of Yunta.	Crystals found in gold workings.
Wadnaminga goldfield, 25 m. SE of Mannahill.	Crystals found in gold workings.
Teetulba goldfield, 26 m. NW of Manninhill.	Crystal found in gold workings.
Prince Albert Copper Mine, 14 m. NE of Adelaide.	Crystals found during mining.
Mt Lofty quarries, 4 m. SE of Adelaide.	Crystals found during mining.
Silver	
Moonta, Wallaroo, Burra Copper mines.	No record was kept of the silver content of copper ores smelted but the total would be very high.
Glen Osmond, nr Adelaide.	Silver lead ores in veins were worked in the 1840s.
Mt Malvern Mine, 10 m. S of Adelaide.	Argentiferous galena in a gangue of barite. The gangue carried cerussite and silver chloride with small amounts of copper carbonate.
A Broken Hill mine SW of Mannahill.	Ore mineral was cerussite.
Tin	
chief ore mineral of tin is cassiterite.	
Near Earea Dam, between Kingoonya and Tarcoola.	
Tungsten	
Callawonga Ck., 50 m. S of Adelaide.	A small amount of wolfram (ferberite) was produced.
Langton I.	A small amount of wolframite was produced.

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Antimony	
Carbine Hill, Nth Dundas.	Small amount of antimony is associated with a complex lead-zinc-containing deposit.
Asbestos	
Anderson's Ck., 25 m. NW of Launceston.	Deposits occur in the northern part of a belt of serpentized pyroscerite intruded by acid and intermediate plutons.
Between Dundas and Rosebery, 20–25 m. W of Queenstown.	Veins of asbestos occur throughout the serpentine. The asbestos is of good quality.
Asbestos Point, SW slopes of Macquarie Harbour; Spero R., 20 m. S of Asbestos Point; nr Ulverston, on the N coast.	
Barite	
Madam Howard Plain, 4 m. NW of Queenstown.	Deposits traverse Cambrian sandstone, associated with porphyroidal rocks, and consist of a main lode and several small lodes and veins.
Intercolonial Spur at Mt Jukes, 8 m. S of Queenstown.	A barite lode on Intercolonial Spur has a length of 1700 ft. and a width ranging from 1 ft. to 8 ft.
Beulah, 18 m. S of Devonport.	A barite lode with several associated minor veins at Beulah. The veins are fissure fillings, dip almost vertically, and are parallel to the strike of the sandy slates in which they occur.
Mt Lyell, and in the zinc-lead deposits of the Read-Roseberry district.	Barite is associated with copper ore.
Bauxite	
Ouse, 55 m. NW of Hobart.	
St Leonards, SE of Launceston.	The deposits like those of Ouse, formed on a dolerite sill and are overlain by Tertiary fresh water sediments.
Myalla, 11 m. NE of Wynyard.	
Small bauxite deposits occur at many places between Beaconsfield, 25 m. NW of Launceston, and Campbell Town, 40 m. SSE of Launceston and near Swansea, 30 m. SE of Campbell Town.	The deposits are too small to be of economic importance.
Beryl	
Royal George district, 15 m. E of Avoca.	In tin bearing veins.
Great Republic Tin Mine, Ben Lomond, 14 m. N of Avoca.	Fairly large crystals in a pegmatite dyke.
Bismuth	
Shepherd & Murphy Mine—Moira district.	At the surface the orebodies are partly covered by basalt. They consist of four parallel quartz veins. The average width is between 8 and 20 in., the lengths range from 450 ft. to 1300 ft. The principal ore minerals are wolfram and cassiterite, with bismuth and pyrite, chalcopyrite, molybdenite and galena.
Federation Mine at Heemskirk on the W coast.	
Waverley Mine, Weldborough, in the NE of the State.	
Chromite	
Adamsfield osmiridium deposits, abt 50 m. W of Hobart.	Chromite occurs.
Montagu Swamp, abt 20 m. from Smithton.	Chromite occurs.
Anderson's Ck. lateritic iron deposit near Beaconsfield.	Chromite occurs.
Barnes Hill, 2½ m. SW of Beaconsfield.	Small concentrations of detrital chromite occur.
Cobalt	
chief ore minerals of cobalt are, smaltite, cobaltite, erythrite, and asbolite.	
Mt Remus, 15 m. SSW of Moina.	Cobaltiferous pyrite occurs with molybdenite, quartz, vanadrum-bearing chlorite in a narrow lode.
Copper	
Mt Lyell field near Queenstown, on the western flanks of the West Coast Range.	The Mt Lyell deposits have been one of Australia's most important sources of copper.

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	The mines are in a narrow belt extending over a distance of 2½ m. from the northern side of Mt Lyell to the northern side of Mt Owen, the next mountain to the south.
Jukes-Darwin field, is situated about 10 m. S of the Mt Lyell field.	The orebodies are similar and occur under similar geological conditions and structural relations to these at Mt Lyell.
Mt Balfour field, abt 30 m. NW of Waratah.	The copper deposits contain bornite and chalcopyrite and occur in ultrabasic rocks.
Scamanderfield, near St Helen's on the NE coast.	The copper deposits are low-grade.
Five Mile or Cuni area, abt 5 m. NE of Zeehan.	The copper-nickel deposits are of the sulphide type; the chief minerals are pyrite and chalcopyrite. The oreshoots or lodes occur in an ultrabasic rock. Recent drilling has shown the oreshoots to cut out about 130 ft. below the surface.
Trial Harbour, 12 m. W of Zeehan.	Nickel was reported.
Beaconsfield, NW of Launceston.	Extensive deposits of nickeliferous material occurs about the valley of Anderson Ck., 5 m. W of Beaconsfield.
Corundum	
Blyth R., Boat Harbour and Bell Mountain, nr Burnie.	In alluvials of the tin mining deposits.
Diamonds	
Corinna situated on the Pieman R.	In alluvial river gravels.
Savage R.	In alluvial river gravels.
Donaldson R.	In alluvial river gravels.
Garnet	
Grassy (King I.).	Well-formed crystals of andradite and grossularite are abundant in garnet hornfels and garnet pyroene hornfels beds.
Gold	
Tasmania has not been an important producer of gold. Recorded production from 1880 to 1961 totals 2,539,832 fine oz. Gold has been won at many places in the north-east and on the west coast of the island, but the most important sources have been the Beaconsfield, Mathinna, and Lefroy fields.	
North-East Region	
Beaconsfield Goldfield—On the west side of the Tamar estuary about 26 m. N of Launceston, comprised essentially one mine, the Tasmania.	The deposit was in a steeply-dipping quartz reef in sandstone of probable Ordovician age. The reef ranged from 2–25 ft. wide, 1300 ft. long and was mined to a depth of 1500 ft., from where it still continued downward. Operations ceased mainly because of water influx. At its west end, the reef is cut off by a fault; the east end dies away after splitting into several veins. A second fault near the west end has displaced the reef about 230 ft. laterally. Above the 400-foot level the ore was essentially free gold in quartz. Below this the reef contained considerable pyrite and some chalcopyrite and sphalerite, and as much as 3 dwt. per ton of the gold was locked in these sulphides. In the upper 400 ft. of the mine the recovery grade averaged almost 25 dwt. per ton; it fell off with depth, but increased again on the lowest level developed.
	A second reef, the Moonlight-cum-Wonder, was exploited to a depth of 800 ft., but good grades extended only to a depth of about 250 ft.
Mathinna Field—17 m. N of Fingal in the NE of the State. The Mathinna field is part of a belt of gold-producing districts stretching northwards from Mangana, near Fingal, through	A zone of close folding about 50 yds. wide trends NW for 2 m. Most of the quartz reefs occur along and on either side of this zone, but there is no apparent relation between the rock

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
Mathinna, Mount Victoria, Alberton, Warrentinna and Forester to Waterhouse Point and Waterhouse I. on the north coast.	structures and the reefs. The reefs range from a few inches to 30 ft. wide and most are less than 100 ft. long.
Lefroy Field—Is about 25 m. NNW of Launceston.	About 30 auriferous quartz reefs occur on the field in slightly metamorphosed Lower Palaeozoic sandstone and slate. The reefs fill a series of fault fissures, all with the same strike, but many have been crushed by later movement of the faults.
West Coast	
Mount Lyell mine near Queenstown.	The ore-bodies were originally worked for gold, and gold has been an important by-product of the subsequent copper mining operations. Total production of gold from the Mt Lyell group of ore-bodies is about 578,000 oz.
Other Localities	
Small quantities of gold have been won at many other places in the State, of which the most important have been Burnie on the north coast and Cygnet, 25 m. SW of Hobart.	
Graphite	
East Ulverstone.	Graphite is present in graphitic schist.
Burnie.	Graphite occurs in schists similar to those at Ulverstone.
Arthur R., abt 2 m. downstream from the junction with the Hellier R.	A 5 ft. face of graphite has been reported.
Cape Barren I.	
Heavy Minerals and Beach Sands	
Zircon, Rutile, Ilmenite, Monazite.	
Flinders I.	Ilmenite and rutile occur together on the beaches of the NE coast of Flinders I.
Strahan (W coast Tas.).	Ilmenite and rutile occur together on the coast near Strahan.
Hobart.	Ilmenite alone occurs on the beaches S of Hobart.
Tamar R. (nr Launceston).	Ilmenite alone occurs along the Tamar R. nr Launceston.
Lakes of the Central Highlands.	Ilmenite has been reported around the shores of these lakes.
Lewis R. district.	Rutile in alluvial deposits between Macquarie Harbour and Port Davey.
Ulverstone district.	Rutile derived from pre-Cambrian schists occurs in detrital deposits and tertiary quartzites.
Boat Harbour, 17 m. W of Burnie.	Zircon in alluvial deposits along a small creek nr Boat Harbour.
Iron	
Principal sources of iron are oxides of hematite, magnetite, goethite and limonite.	
Numerous masses of ironstone outcrop in a belt of metamorphosed amphibolite ½ m. wide and abt 25 m. long extending N from the Meredith R. to the upper reaches of the Savage R.	
Savage R., abt 20 m. SW of Waratah.	The magnetite deposits are situated on either side of the Savage R.
Anderson's Ck., 3 m. W of Beaconsfield.	Iron deposits have been reported.
5 m. from the mouth of the Blyth R.	Iron deposits have been reported.
E of Burnie, nr Natone.	Iron deposits have been reported.
5 m. W of Zeehan.	Iron deposits have been reported.
Lead and Zinc	
Zeehan–Dundas (lead–zinc).	Lodes in proterozoic and Lower Palaeozoic sediments, including limestone and basic volcanics intruded by Devonian granite deposits are along shear zones and in irregular fractures.
Read–Roseberry, 20 m. NE of Zeehan (lead–zinc).	Ore deposits are in tuffaceous sediments near their junction with Pyroclastic Rocks and in

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MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
	some cases occur in a bed of sericite schist.
Mt Farrell, 6 m. NE of Roseberry (lead–zinc).	Fissure veins in shear zones.
Small amounts of lead have been won from the following localities: Bell Mountain; A few miles W of Round Mountain; Devon Mine, 20 m. S of Ulverstone; Heazlewood Field, 12 m. WSW of Waratah; Mt Lyell; Round Mountain, 25 m. S of Ulverstone.	Shoots in softer beds of quartzite.
Manganese	
Dial Range, 10 m. SW of Ulverstone.	The main ore body, elliptical in shape, is 450 ft. long and 200 ft. wide with an average thickness of 10 ft.
Dundas area.	Manganese occurs.
Mica	
Valentine's Peak and Housetop Mountain, S of Burnie.	Mica occurs in granite.
Nr Killiecrankie Bay on Flinders I.	Muscovite books occur in quartz and pegmatite veins in granite.
Cardigan R., SW of Queenstown.	Large muscovite flakes occur irregularly in quartz-impregnated mica schists on the river.
Gladstone, 18 m. NE of Derby.	Muscovite occurs in fine, clear flakes in granite.
Kelvin tin mine, 6 m. SW of Zeehan.	
Molybdenite	
Moina.	Molybdenite is present in the tin–wolfram–bismuth lodes.
King I.	2–3 percent molybdenite is recovered as a by-product of scheelite.
Mt Stronach near Scottsdale.	Molybdenite is associated with granite at Mt Stronach.
Platinum	
Adamsfield, situated between the Gordon and Florentine R.'s 56 m. W of Hobart.	The main lode occurs at the northern end of a serpentine dyke intruding conglomerate, quartzite and limestone. The osmiridium-bearing portion of the lode consists of narrow veins of serpentine; lumps of chromite up to 4 in. in diameter occur in the lode. The osmiridium is found as nuggets up to 1 oz. in weight. Alluvial deposits of osmiridium occur with sand and clay, with pebbles along small stream valleys.
Blad Hill; Savage R. field, 15 m. from Waratah.	Alluvial workings are situated around Blad Hill and in the valleys of the Hazelwood R. and Nineteen Mile Ck. The osmiridium occurs along the stream course.
Mt Stewart, 13 m. SW of Waratah.	Deposits are in recent stream gravels and are derived from a small area of serpentine in the headwaters of Loughnan Ck.
Wilson R. area, N of Renison Bell.	Osmiridium, derived from serpentine bronzite and peridotite, occur in recent stream gravels and overlying serpentine.
Quartz Crystals	
Gladstone and Mt Cameron, NE Tasmania.	Quartz crystals can be found in the tin bearing gravels of this area.
Silver	
Read–Rosebery area, 70 m. S of Burnie.	Silver-lead-zinc mines. Deposits are metasomatic replacement bodies in sheared tuffaceous shale.
Mt Lyell area near Queenstown.	Silver produced as a co-product of copper mining.
Mt Farrell, 6 m. NE of Rosebery.	Silver produced as a co-product of lead mining.
Magnet Mine, 4 m. W of Waratah.	Ore bodies in shear zones. Silver-bearing minerals were galena, pryrargyrite tetrahedrite and sphalerite (marmatite).
Zeehan–Dundas area, 20 m. NW of Queenstown.	Fissure lodes striking parallel to a strong fault; the principal mineral being argentiferous galena.
Other Tasmanian localities from which silver	

MINERAL & LOCATION	DESCRIPTION OF DEPOSITS
has been won: Round Mountain or Round Hill, 25 m. S of Ulverstone; Wilmot Silver Mine nr Bell Mountain; Devon Mine, 4 m. S of Round Mountain; Heazlewood Field, 12 m. WSW of Waratah; Scamander district, 10 m. S of St Helens.	
Tin	
Branxholm–Blue Tier vein.	Tin is associated with an acid granite which forms veins in non-tin bearing granite. Small amounts of wolfram, molybdenite and other sulphides accompany the tin.
	Tin is associated with the deep lead sediments.
Ringarooma R. deep lead extends over a large area downstream from Branxholm: The important mines were: Briseis on the Cascade R. lead; Pioneer Mine on the Wyniford lead; Arba Mine on the Branxholm Ck. lead.	It is usually concentrated towards the base of the leads. In places the leads are covered by basalt.
Alluvial deposits occur S of Mt Cameron nr the Ringarooma R.	These have been dredged.
Gladstone area: Musselroer and Scotia leads.	Tin deposits have been worked.
Boobyalla R. delta.	Large low-grade alluvial deposits occur.
Aberfoyle Mine in the Avoca district, 40 m. SE of Launceston.	The tin occurs in veins associated with wolfram sphalerite, scheelite, pyrite, molybdenite, chalcopyrite, galena, magnetite and native bismuth, copper and gold.
Storey's Ck. mine, 2 m. NW of the Aberfoyle Mine.	Tin occurs associated with wolfram.
Rex Hill, 5 m. SW of Rossarden.	Tin occurs in alluvial deposits.
St Helens.	Tin occurs in alluvial deposits.
Flinders and King Is. in Bass Strait.	
Mt Bischoff Mine, 1 m. N of Waratah.	Lead, zinc, copper and antimony are associated with the tin in small amounts. The ore bodies are large and contain quartz with cassiterite.
Mt Cleveland Mine, abt 8 m. W of Mt Bischoff.	Cassiterite occurs in pyrhotite-pyrite lenses in a sequence of banded tuff and slate.
Mt Balfour field, 15 m. E of Temma.	
Renison Bell area, 9 m. NE of Zeehan.	Tin occurs in dykes.
Heemskirk–Zeehan area, 20 m. NW of Queenstown.	Tin occurs in granite.
Rosebery area, 20 m. N of Queenstown.	Tin has been obtained from quartz tourmaline lodes.
Cox Bight.	Alluvial tin has been reported.
Moth Ck.	Alluvial tin has been reported.
Ray R.	Alluvial tin has been reported.
Tungsten	
King I.	Large ore bodies worked by open cut. Rocks in mine area are marble, pyroxene garnet, actinolite, biotite-feldspar, and actinolite-biotite-feldspar hornfelses. In contact with a granite outcrop south of the mine. Ore is finely disseminated scheelite. In andradite-quartz skarn.
Storey's Ck. Mine, 14 m. by road NE of Avoca.	Veins and veinlets in quartz. Country rocks are slate, sandstone, and quartzite with interbedded volcanics intruded by granite. Chief ore minerals are wolfram and cassiterite, sulphides of pyrite, pyrrhotite, marcasite, and chalcopyrite, sphalerite, stannite, matildite, and galena.
Aberfoyle mine, 2 m. SE of the Storey's Ck. mine.	Minerals are produced from quartz veins. The mine is worked mainly for tin but is an important producer of wolfram.
Moina district, 25 m. SW Devonport, Moina Tungsten mine.	Cassiterite wolfram and bismuth occur in narrow quartz veins in metamorphosed sandstone and impure limestone.

GLOSSARY OF MINING AND GEOLOGICAL TERMS

ACID ROCK Igneous rocks containing over 66 per cent of silica in their total composition, i.e. dacite, granite, quartz porphyry.
ADAMANTINE Having a brilliant lustre like diamond.
AGGLOMERATE A rock mass composed largely of fragments of volcanic rocks.
AGGREGATE A mass or collection of mineral fragments.
ALLOY A metallic substance containing more than one kind of metal.
ALLUVIAL Clays, gravel, sands, etc. deposited by running water.
ALTERED ROCK OR MINERAL One that has undergone chemical changes since it was first deposited.
AMALGAM An alloy of mercury with another metal, especially silver or gold.
AMORPHOUS A mineral without definite crystalline form.
ANDESITE A silicate of alumina, lime and soda.
ANOMALY Unevenness or irregularity of condition.
ANHYDROUS Without water.
ANTICLINE An arch-like formation in rock beds.
APLITE A dyke rock consisting of light-coloured minerals and having a fine-grained texture.
AQUEOUS ROCKS Sedimentary rocks.
ARCHAEAN Geological period preceding the Cambrian; also known as Pre-Cambrian.
ARGENTIFEROUS Containing silver.
ARGILLACEOUS Deposits with a high percentage of clay, i.e. silt, clay, shale, slate.
ARSENIOUS Containing arsenic.
ASSAY The determination of mineral content of an ore.
AURIFEROUS Containing gold.

BASIC ROCK Igneous rock containing from 45 per cent to 55 per cent silica, e.g. basalt, dolerite, gabbro.
BATHOLITH A great mass of plutonic rock, sometimes stretching hundreds or thousands of miles, produced by alteration rather than displacement of the previously existing rocks. Granite is a common batholithic rock.
BEDDED FORMATION A characteristic of sedimentary rocks which have been deposited in successive layers.
BEDROCK Solid rock beneath alluvial deposits, above which heavy minerals may be concentrated.
BENCHES Ledges of rocks or gravel shaped like steps.
BLOWPIPE A tube to force air into a flame, increasing the temperature of the flame and permitting it to be directed.
BOSS Circular outcrop of plutonic rock.
BOTRYOIDAL Minerals occurring in a bunch like formation, e.g. geothite.
BRECCIA A composite rock consisting of angular fragments of stone.

CAINOZOIC The most recent of the four eras of geological time; it comprises the Tertiary and Quaternary periods.
CALCAREOUS Containing calcium usually as carbonate (lime).
CALCIC Containing calcium.
CAMBRIAN The oldest period of the Palaeozoic era.

CLEAVAGE In rocks, the tendency to split along closely spaced parallel planes not related to bedding planes, produced by pressure and generally some recrystallization.
CONCHOIDAL Having the shape of a shell; the term describing the curved shape of fracture surfaces of some minerals.
CONGLOMERATE Gravel or water-worn pebbles cemented together in a mass.
CONTACT Junction between two unlike rock masses.
CONTACT DEPOSIT Orebody formed at junction between two different rock masses, usually an igneous rock and intruded sediments.
COUNTRY ROCK Rock surrounding or penetrated by mineral bearing formations.

DEEP LEAD An alluvial deposit buried beneath volcanic outpourings or a thickness of rock or soil.
DENUDATION Erosion of surface by weather.
DETRITUS Loose collection of rock fragments.
DIABASE Altered basalt or dolerite.
DISSEMINATED ORE Where small mineral particles are scattered throughout the rock.
DOME Uplifted beds like an anticline.
DRUSY Crusty or coated with minute crystals.
DUCTILE In minerals, capable of considerable stretching without breaking.
DYKE Vertical or inclined wall of igneous rock which has intruded into other rock formations.

ELECTRUM Natural alloy of gold and silver.
ENRICHMENT The process of adding to the contents or making richer.
ERA The largest division of geologic time; Archaeozoic, Proterozoic, Palaeozoic, Mesozoic and Cainozoic.
EROSION The processes whereby soil or rock is moved by weathering from water, ice and wind.

FACE Working end of mine or open cut.
FAULT Displacement of portions of rock mass.
FELSIC A general term applied to light-coloured minerals, quartz, feldspar, felspathoids and muscovite.
FERRUGINOUS Impregnated or coated with iron; red-brown.
FISSURE A crack, split or crevice in rocks.
FLAME TEST A test in which a colour imparted to a flame may indicate the presence of certain elements.
FLOATER Loose pieces of ore broken off a vein or outcrop.
FLOOR Flat or horizontal ore body.
FLUORESCENCE The emission of visible light by a substance exposed to ultra-violet light.
FOLD Bending in rocks.
FOLIATED In leaves as mica.
FOLIATION Parallel structures produced in rocks by metamorphism, e.g. banding due to segregation of minerals.
FOOTWALL The junction of an orebody and the country rock on the lower side of the ore body.
FRACTURE The characteristics of a freshly broken surface which may be distinctive for some minerals.

GANGUE The valueless rock in which an orebody occurs.
GEODE Cavities or hollow nodules formed in sedimentary rock and lined with crystals.

GLACIAL Pertaining to ice action.
GLANCE Term used to describe minerals with a resplendent lustre, e.g. lead glance, silver glance.
GNEISS A coarse-grained banded rock in which layers of granular minerals alternate with layers of flaky minerals.
GOSSAN A ferruginous outcrop or deposit filling the top of a decomposed ore body, usually porous and may be enriched.
GREENSTONE Any altered basic igneous rock coloured green by chlorite, hornblende or epidote diabases and diorites.
GREYWACKE Shaly sandstone.

HACKLY Fracture showing jagged points on the surface.
HANGING WALL The junction of an ore body and the country rock on the upper side of the ore body.
HARDNESS In solids, the resistance of the substance to scratching.
HARDNESS SCALE A set of standard minerals devised by Mohs with which the hardness of a substance is compared.
HYDRATED Combined with water.

IGNEOUS Rocks which have solidified on cooling from a molten mass.
INTRUSION A mass of igneous rocks which while molten have forced themselves into other rock masses, e.g. granite.

LACCOLITH Intrusive mass of igneous rock which has penetrated the earth's crust but not reached the surface.
LATERITE A red, porous, ferruginous rock.
LENTICULAR Lens shaped.
LOAMING Tracing alluvial minerals back to their source by collecting surface samples and panning them for traces of the mineral.
LODE A deposit of metallic ore found as an irregular vein or fissure in quartz and other rocks.
LUSTRE The character of the light reflected from the surface of a mineral.

MAGMA Liquid molten rock from which igneous rocks are formed.
MATRIX Rock that contains minerals or ore.
METAMORPHISM Changes in form, texture or composition in a rock by agencies such as heat, pressure, moisture.
METASOMATITE A rock in which one substance has completely replaced another producing an entirely new composition.
MINERAGRAPHY The study of polished surfaces of minerals.
MINERAL Any rock substance which can be represented by a definite chemical formula.
MULLOCK Waste rock accumulated around a mine.

NATIVE A mineral which occurs in nature as a pure metal and not combined with other elements, e.g. native gold, native silver.
NODULE Small, rounded lump of mineral, usually harder than the surrounding sediments.

OCHRE A natural powdered mineral which is utilized as a pigment.
ORE Metal-bearing mineral or rock.
ORGANIC Of animal or plant origin.
OVERBURDEN Material overlying a mineral deposit.
OXIDIZED ZONE The upper part of an ore body altered by oxygen and water.

PALAEOZOIC One of the major eras of geologic time.

PEGMATITE Coarse-grained igneous rock with crystals very pronounced, usually mica and felspar. The source of many gems and non-metallic ores. Also a source of cassiterite and wolframite.
PETROLOGY The study of the origin, structure and composition of the rocks and mineral aggregates constituting the earth.
PIPE DEPOSITS Elongated formation carrying ore deposits, sometimes continuing to great depths. Diamonds at Kimberley, South Africa are mined from peridotite pipes. Quartz crystal and molybdenite are minerals found in pipe deposits.
PLACER DEPOSIT A mass of loose material such as sand resulting from weathering and erosion of rocks, and containing valuable heavy minerals such as gold, tin and platinum.

QUARTZITE A rock in which the grains of quartz are cemented by quartz.

REEF Vein.
REPLACEMENT In which one mineral is replaced by another often retaining its original structure or crystalline form.
RIFFLE A cross bar in a sluice box or cradle to retain heavy minerals.

SADDLE A saddle-like formation (an anticline). A saddle reef is a vein located across the crest of an anticline.
SANDSTONE Sedimentary rock composed of cemented grains of sand.
SCHIST A foliated rock which breaks with a wavy, uneven surface, e.g. mica schist.
SECONDARY Rocks and minerals formed from pre-existing rocks and minerals.
SECONDARY ENRICHMENT An alteration of the original formation or ore body by other material causing enrichment of the ores present.
SECTILE Cuts easily without breaking up.
SEDIMENTARY Formed from sediments.
SILICATE Composed of silica.
SILICEOUS Containing or pertaining to silica.
STRATIFIED Formed and lying in beds.
STRATIGRAPHY The study of the formation, composition, sequence, age and correlation of the layered rocks of the earth.
STREAK The colour of the powder of a mineral; important in identification of some minerals.
STRIATED Marked with fine parallel grooves.
SYENITE A plutonic igneous rock consisting mainly of alkalic feldspar usually with one or more mafic minerals such as hornblende or biotite.
SYNCLINE A fold in rocks in which the beds dip downwards from both sides towards the axis (opposite to anticline).

TERTIARY The earlier and the longer of the two periods of the Cainozoic era.
TUFF Volcanic dust and sediment compacted to form a rock.

ULTRABASIC ROCK Igneous rocks containing less than 45 per cent silica.

VEIN Defined mineralized zone—usually consists of a single mineral (e.g. quartz or calcite) or an ore.
VITREOUS LUSTRE The lustre of broken glass.
VUGH Cavity in rock, often lined with crystals.

WALL ROCK Country rock on either side of a vein or deposit.
WASH Mineral-bearing gravel.
WEATHERED Rocks that have been affected by water, air and temperature causing structural breakdown.

XENOLITH A piece of rock included in an igneous rock in the course of intrusion.

FURTHER READING

Books for Children

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The Geological Society of Australia publishes volumes on the

geology of each State as parts of its Journal. Publications can be obtained from the Bureau of Mineral Resources, the state geological surveys and mines departments, the Geological Society of Australia and the various scientific societies in each state.

Each of the State mines departments issues an inexpensive prospector's guide. Maps can also usually be obtained from this source or from the Commonwealth Bureau of Mineral Resources.

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Australian National Parks: The South
Australian National Parks: The West and Centre
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Australian Rock and Tree Orchids
Australian Sea Shells
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